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# CHINA REPORT

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## NATIONAL DEVELOPMENTS

### PAST, PRESENT, FUTURE OF PSYCHOLOGY IN CHINA DISCUSSED

Beijing XINLI XUEBAO [ACTA PSYCHOLOGICA SINICA] in Chinese No 3, Nov 79  
pp 255-266

[Article from the Teaching and Research Section of the Education Department  
of Shaanxi Normal University: "Thirty Years of Psychology in China"\*]

[Text] Editor's Note: While celebrating the 30th anniversary of the founding of the Chinese People's Republic, a look back over the tortuous process of development that has taken place during the past 30 years and a summarization of the lessons of this experience is helpful in serving the mission of the new period. Because of the special nature of the study of psychology, there are quite a few academic problems that are still difficult to decide in a clear-cut way, but this magazine, in pursuance of a policy of letting a hundred schools of thought contend, has allowed psychologists within the country to examine and analyze them from different aspects and different angles and express their own views. The two pertinent articles appearing in this issue of the periodical are examples of this policy. It is hoped that psychologists throughout the country will launch conscientious discussions of them.

The origins of psychology in China go back a long way in history. Among the writings of China's very ancient past are many theories and data pertaining to psychological issues that merit our exploration and study. But the appearance in China of psychology as an independent science took place only during the final years of the Qing Dynasty following the introduction to China of modern Western science.

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\*Consulted in the preparation of this article has been Xu Lianchang's [1776 5114 0221] article, "Thirty Years of Psychology in China," which is to be published in a forthcoming issue of ZIRAN ZAZHI [Nature Magazine] and deals with work in practical psychology, engineering psychology, and medical psychology.

In the old semi-colonial, semi-feudal China, the position of scientists was dismal, and the position of psychologists was even more so. "In China prior to Liberation, the tree of psychology could not grow tall and neither could it blossom and produce fruit; it could only manage to survive."

In 1949 the great victory of the Chinese people's revolution put an end to the old semi-colonial and semi-feudal China, and established a socialist new China. From this time on, the Chinese people walked the radiant and resplendent road of socialism. The development of Chinese psychology also entered a brand new historical stage.

Not long after the establishment of the People's Republic, a scientific research organization was rapidly established through the solicitude of the party and the people's government. Psychology was set up as a special field of study, and courses in psychology became part of the curriculum throughout the country in individual normal schools and colleges, in some universities, and in some sports institutes. This laid a foundation and created the conditions for the development of psychology in our country.

During the past 30 years, the development of psychology in China has gone through roughly four stages: reform, flourishing, destruction, and rebirth.

1. The period from the birth of the new China in 1949 until the 1958 campaign of criticism of psychology was a period of professional reform of psychology in China. This period was subdivided into three stages in which three problems were solved.

The first stage was from the establishment of the Chinese People's Republic in 1949 until the conclusion of the thought reform campaign in 1952. During this stage, psychologists in our country went through the study of the writings of Marx, Lenin, and Chairman Mao, with special study being devoted to "Materialism and Empiriocriticism," "Philosophical Notes," and "On Contradictions," and "On Practice." They also participated in the thought reform movement for intellectuals and began to realize that on the question of what constitutes psychology, this question about the object of study in psychology, a fundamental difference existed among materialists, idealists, and mechanical materialists. Dialectic materialism maintains that an individual's psychology is a reflection of objective reality; that it is the function of an individual's brains, and that no human psychology exists apart from objective reality and the human brain. The idealists and the mechanical materialists beat about the bush and resort to all manner of means to depict human psychology as an unfathomable thing or else deny the existence of psychology outright.

They also came to realize that before Liberation, though many psychologists in our country had conducted research into numerous aspects of the psychology of Chinese characters, physiological psychology, child psychology, and educational psychology, and had made definite contributions, only a minuscule number of psychologists had tried, using the influence of

Marxism and Soviet psychologists, to apply the dialectic materialist viewpoint to the study of complex psychological phenomena. However, because of the limitations of historical conditions in the society of that time, these efforts and expectations on the part of psychologists were unable to develop.

The second stage was from the conclusion of the thought reform campaign in 1952 until the rectification campaign of 1957-1958.

During this stage, one of the main questions that our psychologists studied, criticized and discussed continued to be the question of the object of the study of psychology, and at the nucleus was the question of the relationship between higher nervous activity and psychological activity. Discussion of this question was raised in the process of learning from the Soviet Union.

Under the influence of the Soviet Union, apart from active maintenance of regular study of Marxism, our country's psychologists concentrated on the study of the theories of Pavlov. Beginning in the summer of 1953, Pavlovian Societies with a membership of several thousand were operating in Beijing, Shanghai, Tianjin, Kunming, and Xian to form a high tide in a nationwide study of Pavlov's doctrine. The study of Pavlov's doctrines was of great significance in emphasizing for Chinese psychologists the study of physiological mechanisms in psychology and the use of experimental methods for conditioned reflexes. However, under the influence of the Soviet Union, it was wrong to replace psychology with the doctrines of Pavlov and to make Pavlovian doctrines a hallmark for the appraisal of all else.

While Chinese psychologists were studying the doctrines of Pavlov, they were also actively studying Soviet psychology; specifically, the Ministry of Education invited Soviet experts in psychology to teach in China beginning in 1952, and this brought about a further upsurge of learning from Soviet psychology.

In their studies and discussions, Chinese psychologists used Marxism as their guide and Soviet psychology as the source of their experience. They engaged in discussion of numerous questions about the object of the study of psychology, its mission, its methods and the subject matter, but at the nub lay the question of the relationship between higher nervous activity and psychological activity. There were three main views on this question. These three views collectively reflected three separate attitudes and three understandings of the time on the question of what psychology was a study of. One was a unity theory whereby higher nervous activity and psychological activity were combined and the two were held to be indistinguishable, and thus it was proposed that psychology could be combined with the physiology of higher nervous activity and be called the study of higher nervous activity.

Alternatively, it was proposed that the study of higher nervous activity, which was currently in the process of development, could not yet encompass the sphere of psychological activity, but after it had been deeply studied for a while, it would certainly become one with it. The essence of the matter was stated as: psychology has no object of its own and it is not qualified to exist. Even though it may manage to survive for the present, in future it will certainly be replaced by the physiology of higher nervous activity.

A second view was the theory of opposites. In this view psychological activities and higher nervous activities were seen as totally antithetical. They maintained that psychological activities and higher nervous activities were two different aspects of the activity of the same material organ--the cerebrum. They were, namely the material aspect and the non-material aspect; the physiological aspect and the psychological aspect. Though the activity of these two aspects derived from the cerebrum, they were not interrelated. Alternatively it was supposed that higher nervous activity was the material foundation for psychological activity and that psychological activity was the result of higher nervous activity, with the foundation and the result being completely different. In essence, this was a denial of restraint on psychological activity by higher nervous activity, and a denial of the significance of research results on the physiology of higher nervous activity in revealing the laws of psychological activity. It was also a denial that the Pavlovian theory of higher nervous activity was a solid natural scientific foundation for remolding psychology.

Third was the theory of the unity of different, which held that the relationship between higher nervous activity and psychological activity was a dialectically unified relationship. Higher nervous energy activity was a form of the motion of matter in the natural world, and psychological phenomena were a manifestation of higher nervous activity. Therefore, though it was not possible to say that psychological phenomena were in themselves matter, they were part of matter and a manifestation of the motion of matter. They were subject to the controls of the laws of the motion of matter. This was, in essence, both a recognition of the relationship between higher nervous energy and psychological activity, and maintaining the significance of higher nervous activity in psychological research. It also recognized a distinction between the two, and opposed the liquidationism of psychology.

As a result of discussions, most psychologists in our country came to agree with this third view, deciding that psychological activity was inseparable from higher nervous activity, and that the laws of psychological activity were regulated by the laws of higher nervous activity. Full use would have to be made of the results of research in the physiology of higher nervous activity to reveal the laws and physiological mechanism of the psychological activities of people.

It was under the guidance of this understanding that psychologists in our country tried to apply Pavlovian theory to questions about the physiological mechanism of psychological activity involved in the sense of perception, consciousness, attention, memory, thought, emotions, and even individual traits, and strove to place human psychological activity on a foundation of the physiological mechanism. At the same time, our psychologists repeatedly studied and grasped Comrade Lenin's teaching that, "scientific psychologists have discarded philosophical theories about the soul and have directly studied the material noumenon (neutral process) of psychological phenomena to actively launch study of the physical mechanism of the psyche."

These studies further demonstrated that psychological phenomena are the human brain's reflection of the processes and laws of objective reality, and have demonstrated that use of the scientific results and objective methods of the Pavlovian theory of higher nervous activities to explain, demonstrate, and study, and explore the laws of psychological activities is an effective method.

Our country's psychologists also tried to use the guidance provided by Marxist philosophy to analyze and criticise the Western psychological schools of thought represented by the behaviorists, the Gestaltists, the Freudians, and particularly John Dewey's pragmatism. Though these analyses and criticisms were neither specifically nor completely adequate, they provided active impetus at the time to our destruction of the old to build the new and in carrying out a reform and a reconstruction of psychology.

The third stage was from the 1957-1958 rectification campaign until the criticism campaign against psychology.

In March 1958, the Psychology Institute of the Chinese Academy of Sciences launched a debate on the question of whether psychology should enhance its integration of theory with practice which lasted until the August 1958 campaign of criticism against psychology.

Prior to the campaign of criticism, the principal question was to figure out how psychology could better serve socialist construction.

During the latter part of the rectification campaign, psychologists throughout the country combined the summary criticisms of teaching and research work to launch discussion and debate on the question of how psychology could be combined with reality to serve socialist construction. Emphasis was placed on the issue of psychology in the service of reality; impetus was given to the development of applied psychology, and many achievements were registered for both.

1. In the field of labor production, improvement in labor productivity was the major supporting task assigned psychology in the building of our country's production. Psychologists took the road of taking from the masses and going to the masses. They worked with industrial units to operate training



classes in rational operation of equipment, and they helped plants conduct research in worker operation of machinery in stamping workshops, with a resultant reduction in the severity of the labor and improvements in work efficiency. They conducted research in a series of psychological activities relating to effective ways to promote creativity, invention, and technical innovation, such as research into association and "primitive forms," which played an active role in giving impetus to the campaign for creativity, invention and technical innovation. They integrated psychological principles pertaining to the sense of sight and, on the basis of the experience of old workers in looking at fire and theories about steel-making in converters, they discovered a relationship between the color of sparks from a flame, their brightness and shape and other minute changes, and the temperature and chemical reactions inside the converters. From the experience of workers at the steel converters who had "mastered temperature control," they were able to make a scientific summarization. Additionally psychological analyses were also done in safety, and the prevention of accidents and many valuable rational suggestions came out of this.

2. In medical work, particularly in the field of the prevention and treatment of mental illness, psychology played an important role. Psychological clinics, psycho-medical teams, and medical workers cooperated closely, and experiments and research in rapid and comprehensive treatment of neurasthenia and through full use of psychology as an important part of therapy remarkable improvement in effectiveness of treatment was possible. In the process of the treatment of illnesses, the supportive use of certain psychological therapies were also explored in accordance with the different characteristics and psychological make-up of the patients. This was helpful in the diagnosis and treatment of illnesses as well as in getting maximum benefits from medications.

3. In the field of child psychology and education, "experimental research was done on power transmission between the first and second signaling systems in children," "on the function of words in the general cognizance of children," "and preliminary experimental research was done on direction perception in pre-school children." Research was also done on the ages of children at the time they entered primary school. Additionally, in coordination with practice teaching of students in normal schools, Beijing Normal University, in conjunction with other schools, compiled, "Psychological Analysis of Classroom Teaching," and "How To Understand Individual Student Traits" and made preparations for educational research work. The foregoing accomplishments were a good beginning by our country's psychologists in serving socialist construction endeavors.

Building on this good beginning, the psychologists of our country, with a revolutionary spirit born of new circumstances and a new level of understanding, re-examined and revised the "Twelve-Year Development Program for Psychology." The board of directors of the Chinese Psychology Society called upon psychologists to "create a new situation every 3 years," and everybody went into action zealously in an effort to make psychology serve

socialism even better. However, just when our country's psychological work was riding high, when morale was at its best, and when psychological work was just on the verge of giving a good account of itself, a cold wind that stifled psychology began to blow throughout society. In August 1958, some of the teachers and students at Beijing Normal University, with the support and instigation of famous professors and theoreticians at that school, began by initiating a campaign "to criticize the bourgeois tendencies of psychology," and soon the wind sent ripples throughout the land. Using an extremely leftist ideological trend as their keynote, they brandished the huge club of class struggle and blotted out at one stroke the accomplishments of reform by our country's psychologists, accused them of "biologizing," of "being abstract," and of ignoring the class nature of people, labeling psychology a "Pseudo-science." They held up class character as the sole or the principal objective for psychological research, and in complete denial of the laws common to the psychology of mankind, they led psychology into a dead end. They treated all psychologists who had influence or who had made contributions in the field of psychology as "white flags" to be pulled down. They destroyed the party's policy of "letting a hundred flowers blossom and a hundred schools of thought contend," and the party's policy toward intellectuals, wrecked the development of psychological science, and struck at the enthusiasm of psychologists.

Not until December 1978, 2 years after the smashing of the "gang of four," was it publicly announced at the second annual academic meeting of the Chinese Psychological Society, when a letter of congratulation on Comrade Peng Fei's [1756 7378] appointment as head of Beijing Normal University was read, that "the campaign of criticism against psychology in 1958 was mistaken. There was no foundation for the charges that psychology was a 'pseudo-science', or a 'white flag' or blindly worshipped things foreign. On 13 April 1979 at the All-China Educational Science Planning Conference, the deputy minister of the Ministry of Education, Comrade Zhang Chengxian [1728 2110 0341] formally announced: "The Ministry of Education has studied and determined that the campaign that began with criticism of the psychology section of the Education Department of Beijing Normal University and later developed into criticism of psychology throughout the country...was completely wrong...The criticisms of that time were untenable in theory and must be completely overthrown, with those comrades who were criticized and implicated having their reputations restored." With this, the cangue [pillory] that had shackled the thoughts of Chinese psychologists was finally removed, and the history of the "criticism campaign" of 1958 came to an appropriate conclusion.

2. The years 1959 to 1965 were a period in which Chinese psychology began to bloom. During this period, the world of Chinese psychology was in academic ferment and preliminary clarification was made of the chaos in thoughts and theories that had been brought about by the "criticism campaign" against psychology beginning in 1958. New accomplishments in psychology in the various countries of the world were studied, and efforts to combine them with the realities of our own country, and to launch scientific research and teaching work have registered definite accomplishments.

The arrival of this period of blooming in psychology was not by chance. It was an inevitable demand of the development of our country's national economy; it was an inevitable product of the thoroughgoing implementation of the party's policy toward intellectuals, and the policy of "letting a hundred flowers blossom and a hundred schools of thought contend"; and it was also an inevitable trend in the growth of psychology in our country following 9 years of reforms. This period may be divided into two general stages.

The first stage began in March 1959 when the Chinese Academy of Sciences invited psychologists to hold a symposium, and lasted until January 1960 when the second congress of the Chinese Psychology Association ended.

This stage was one in which Chinese psychologists cleared away obstacles to the complete launching of scientific research and education work, and smoothed the road through academic discussions, integration of ideology, and making clear distinctions between right and wrong. Though numerous questions were discussed, the main topic for discussion was still the question of the object of psychology, i.e. just what should psychology be a study of, and what should it not be a study of. At its core, this is a question of the relationship between the class character of human psychology and common laws.

On 31 March 1959, the placid world of Chinese psychology really sprang to life again. The Psychological Research Institute of the Chinese Academy of Sciences invited psychologists from appropriate units in the Beijing area to participate in a forum on psychological problems. The forum held discussions and exchanged views on the object of the study of psychology, its mission, methods, and subject matter that had been involved in the 1958 "campaign of criticism" against psychology. Comrades attending the forum unanimously maintained that the achievements since liberation of our country's psychologists in reforming and building up Chinese psychology positively cannot be condemned out of hand. This was the first implicit and determined criticism by our country's psychologists of the 1958 "campaign of criticism." Between 11 and 15 May of the same year, psychologists in the capital conducted discussions again on the subject, the mission, the methods, and the subject matter of the study of psychology. Psychologists from distant Changchun, Haerbin, Guangzhou, Lanzhou, and Huhehaote attended the conference as non-voting members. More than 200 psychologists and educators attended the conference. Comrades were able to explain their own ideas on the basis of what they had learned from their own study, and to engage in enthusiastic discussions. Meanwhile, psychologists in Shanghai, Nanjing, Guangzhou, Xian, Changchun, Hefei, and Wuhan all held their own separate conferences and enthusiastically issued articles. A freewheeling exposition of personal views and a mass academic discussion, a la a hundred schools of thought contending, of unusual swiftness and intensity was launched throughout the country. This symbolized the entrance into a flourishing period for psychology in which a hundred flowers blossomed in a riot of color.



This period of swift and intense force, of spirited debate, and academic discussion unprecedented in scope continued for more than 10 months. Not until January 1960 when the Second Congress of the Chinese Psychology Society victoriously closed could the end of the stage be considered virtually reached.

These discussions touched upon virtually every question about psychological theories. For example, the relationship among the objectives, the tasks, the methods, and the subject matter of psychology, and the relationship between animal psychology and human psychology, the relationship between physiology and psychology, the relationship between the form and content of psychology, as well as the stages of human psychology and common laws. But a single thread running through all these questions was still the question of the subject of the study of psychology, in which the center of attention was whether or not psychology should study the class character of man.

In this discussion, which touched on what psychology should study and what it should not study and which directly bears on the question of the future development of psychology in our country, psychologists in our country used the method of head-on discussion, took aim at some major issues that had been distorted during the 1958 "criticism campaign," stated their attitudes clearly and explained their reasons for them. For example, they pointed at the criticism leveled during the "campaign of criticism," when the results of research into the higher nervous activity of animals was used to explain certain psychological activity in humans. This explanation had been criticized as "taking people to be dogs and making no distinction between men and dogs." They set forth the relationship between the psychology of animals and the psychology of humans, pointing out that though distinctions exist between the psychology of animals and the psychology of humans, relationships also exist, and study of the psychology of animals to reveal the development of the sphere of consciousness and to develop laws is an important task in the study of psychology.

In another example, they took aim at the false accusation leveled during the "campaign of criticism" when the Pavlovian theory of higher nervous activity was used to illuminate and explain psychological phenomena, only to be condemned as "physiological determinism," and "biologization." They set forth the relationship between physiology and psychology, pointing out that the use of results of physiological research and scientific methods to explain and explore through research the physiological mechanism of psychology is a fundamental way of studying how the cerebrum produces the sphere of consciousness and is a basic task of the study of psychology.

As another example they took aim at the "campaign of criticism" for its condemnation as "abstractionist" and "ignoring the class character of mankind and the laws governing them, and even in regard to the basic view of Marxism, namely that human psychology is a reflection by the human brain of objective reality. The psychologists demonstrated the relationship between the class nature of human psychology and common laws, pointing out

that psychology should study the class nature of human psychology and should, even more, study the laws common to human psychology, the more important being the study of the laws common to human psychology.

Following this discussion, our psychologists used a summary of the lessons of experience to define psychology further as a basic science whose basic missions are the study of how the sphere of consciousness arises and develops, the study of the processes and the laws whereby the human cerebrum reflects objective reality, and the study of the formation and laws governing individual psychological traits. Study of the tendentiousness of the sphere of consciousness must involve questions of the effects of human class standpoint and class viewpoint. However, human class character is neither the only object psychological study nor the principal object. Facts fully demonstrate that the basic reason why the 1958 "campaign of criticism" led psychology into a dead end lay in designating study of man's class character as the sole mission of psychology.

The second stage lasted from the close of the Second Congress of the Chinese Psychology Society in January 1960 until 1965 when the hack writings of Yao Wenyuan appeared.

This stage was characterized by a clarification by psychologists of the ideological and theoretical chaos created by the 1958 "campaign of criticism," and went on to respond to the call of the Second Congress of the Chinese Psychology Society to launch across-the-board educational and scientific research work, which brought visible results. For a few very short years in the early 1960's, more than 300 psychological treatises appeared in various publications. When the first annual conference of the Chinese Psychology Society was convened in December 1963, the conference received 203 papers. At this conference a new program of scientific research was also formulated, which further defined the division of labor and the thrust of efforts in the field of psychology, and created more favorable conditions for the development of psychological work. By 1965, the Psychology Institute of the Chinese Academy of Sciences had increased to more than 170 members, and a laboratory with relatively high standards was newly constructed and fitted out with equipment that was quite advanced for the time. International contacts were initiated, and quite a few new accomplishments in scientific research and educational work appeared, which raised the level of our country's psychological science a bit. These new accomplishments were concretely manifested in the following ways:

1. In the fields of psychological processes and physiological psychology: fairly important research pertaining to sense perception and consciousness: "The Effect of Time Lapse on the Orientation of Tactile Sensation and Kinesthesia"; "The Effect of Work with the Muscles of One Hand on Mis-perception of Shapes and Weights;" and "Misperceptions of Shapes and Weights in Normal Adults." In the fields of memory, concentration, and thinking, research included, "Preliminary Research on Recall of Shapes From Visual and Tactile Memory"; "Passive Effects of Criss-crossing of Figures

on Perception and Thought Processes"; and "Effects of Concentration on the Skin and Action of Blood Vessels." Research using brain electricity and skin electricity to explore the physiological mechanisms of human psychological processes reflected in "Research Using Graphs Showing Brain Electricity and Skin Electricity for Directional Reflexes in Humans," and "Research With Electro-Encephalograms on Tentative Human Links." Research into the psychological processes and physiological mechanisms at work in new theories and technological research such as applied cybernetics, information theory, and stimulation research, there has been, "The Relationship Between Quantity of Information and Reaction Times Under Complex Stimuli," "Effects of Superfluity of Information on Mastery of the Structure of Signals," and "Several Problems in Stimulation Research in Psychological Processes."

2. In the fields of research into developmental and educational psychology, historically unprecedented events took place in our country's study of psychology. During the latter part of 1959, the Psychology Institute of the Chinese Academy of Sciences, in cooperation with 20 normal institutions of higher learning in 17 provinces, municipalities, and autonomous regions launched research into child psychology and educational psychology, which by the end of 1960 had brought visible preliminary results in education reform. The "full day system of reform of the middle and primary school system" was the focus for launching study of child psychology, the psychology of language instruction, the psychology of mathematics instruction, and the psychology of moral education. Within a year's time, 47 research papers resulted from these efforts. In February 1962, the Chinese Psychology Society established the Special Committee on Educational Psychology in Beijing and convened a conference on educational psychology. Participating in the conference were delegates from psychology societies in 16 provinces, municipalities, and autonomous regions as well as psychologists from Beijing municipality. The conference received 102 items in the form of treatises, reports, and materials, of which some concerned age characteristics in child psychology or research into the development of psychology in children; some concerned research into the formation of numbers concepts in the study of the psychology of mathematics; and some were about research into reading instruction, student comprehension of texts and instruction in phonetics as part of the psychology of language instruction. There were also research papers about the psychology of moral education as well as some on child psychology and educational psychology in foreign countries. The conference centered on research methods and on exchanges of views about the characteristics of children at different ages, on the fundamental essence of age characteristics, psychological phases at different ages, the content of age characteristics and age characteristics. In 1963, in the first meeting of the Chinese Psychology Society of the Academic Year, 153 papers were presented of which 59 were concerned with child psychology and 94 were concerned with educational psychology. These accounted for more than three-fourths of the papers presented at conferences throughout the year. From this may be seen the spectacularly rapid rise of research into developmental and educational psychology.

Truly outstanding progress had been made in terms of accomplishments in child psychology and educational psychology. For example, on the issue of motivation in the development of children's psychology, quite heated debate took place among psychologists. Though complete uniformity of understanding was reached on the issue, nevertheless, the discussion heightened this understanding and gave impetus to advanced in research work on the subject. Psychological traits in children of various ages were linked to specific issues in the reform of instruction, such as experimental research with school age children when first entering school at the age of 6, experimental research with putting some arithmetic into the primary school curriculum, and research with language instruction beginning from primary school. This research yielded much first hand materials and also solved some real problems. From the many research materials about brain development in the children of our country, the development of thinking, and the development of memory, various tendencies and stages in the development of the psychology of children can be preliminarily demonstrated. Definite achievements were also obtained from the psychological analysis of the process whereby primary school students learn to read, from the psychological analysis of the mastery of applied systems, as well as from psychological analysis of moral character training for students.

Additionally, systematic educational theories were introduced to our country from abroad. These were combined in experiments with teaching practices in our country's schools, where both straight line and divergent procedures were used to compile some materials for programmed instruction, and to manufacture some simple teaching machines for which some preliminary successes were realized. Under the same circumstances, when little time was used for experimental classes, achievements were also rather good. However, it was also discovered that with many problems, such as when teaching materials were too long, students could not easily form a complete concept. Later on, further integration with actual circumstances in our country was done and the programmed teaching materials were shortened and simplified to become materials provided to the student for self-study.

3. There were also new developments in research into labor psychology and engineering psychology. For example, research into rationalization of operations saw psychological forecasting of flying ability, and analyses of the psychological characteristics of advanced producer operation processes. The focus of research during this period was shifted to engineering psychology, including the development of devices that discriminate amount, such as the frequency of flashing signals and discrimination of threshold, and to the interference with meaning of the use of rapid flashing signals and discrimination of threshold, and to the interference with meaning of the use of rapid flashing codes, as well as to the effects on distinguishing signals when their positioning is off and when many signals were being used. Additionally there was research conducted from the angle of information theory on the effects on efficiency of transmission of information between men and machines, resulting from arrangement of signals in space as for example whether an increase in efficiency of transmission of



information could be increased through suitable placement of messages and of the reaction keys. Also studied was the effect on efficiency in transmitting information of language response and action response. Moreover, various standards had to be formulated such as for the evaluation of the sense of sight in athletic competition halls, and standards for lighting in middle school and primary school classrooms. Additionally, appraisals of the design of various instruments using engineering psychology was done with design principles being put forward for keyboard instruments and navigation instruments, including their shapes, scale, indicator needles, graduations, form of lettering, and internal illumination. Engineering psychology was also used to study signal aspect problems in electric power stations with low power centralized controls. The work included layout of the central control room, a determination of the labor intensity of duty personnel, design of signal aspect patterns, and patterns of signal retrieving screens. Simulated research was also undertaken into accidents in the central control room and into rated efficiency of alarm signals. The results of these experiments and the proposals resulting from them were provided for reference in carrying out production and were found useful as, for instance, in the design of large hydroelectric stations.

4. In the field of research in medical psychology, research in comprehensive and speedy treatment of neurasthenia was continued and psychological treatment was used in chronic schizophrenia with different treatment methods being used as the condition changed. For example, psychological treatment consisting of heart to heart talks and participation in group activities were beneficial to the ill in rapidly restoring them to health. Analytical research was conducted on the higher nervous activity characteristics, brain wave characteristics and capacity for abstract generalization in schizophrenic patients. Theoretical study and exploration of the physiological basis for schizophrenia was done, and psychological data were provided for diagnostic work. Additionally, study was undertaken of psychological factors in patients suffering from chronic illnesses such as high blood pressure and ulcers, and definite results were obtained by combining this study with experimental treatment using a system of deep breathing exercises and hypnosis. Because definite accomplishments had been made in clinical treatments as a result of close cooperation between comrades at the Psychological Unit of the Psychology Institute working with medical personnel, advanced units were especially invited in 1959 to attend a conference of outstanding workers. This was an extremely great encouragement to the psychologists who had just gone through the 1958 "campaign of criticism."

In the field of psychology in education work. The Psychology Institute of the Chinese Academy of Sciences, working in cooperation with schools and normal schools of higher learning and proceeding from a basis of summarization of results of scientific research work, published "Common Psychology," and "Educational Psychology," two works that reflected the level of psychological science at the time, and also combined it with Chinese realities. They also published "Child Psychology," a book written by Professor Zhu Zhixian [2612 2535 6343] of Beijing Normal University.

These were the first groups of psychological training materials written and published by psychologists in our country after Liberation. Additionally the educational work done by joint classes in psychology at higher level normal schools also aroused the attention of psychologists, and was explored in specialized publications published inside China. In consequence, definite impetus was given educational work by psychology classes in our nation's institutions of higher learning.

In the field of research techniques, psychologists gave close attention to and achieved preliminary results in theory of information, cybernetics, radio technology, electronic computer technology, and artificial simulation.

From some slight knowledge of results in psychology in foreign countries, there was development from only translations of fragmentary Soviet materials during the period of thought reform to rather broad familiarity with the advanced experiences of Europe, the United States, Japan, and the Soviet Union, and a transition from translation of single articles to comprehensive evaluations of foreign psychological studies.

3. The years 1966 to 1976 were a period marked by the devastation and destruction of the study of psychology by Lin Biao and the "gang of four" in which psychology came to a halt.

Just as our country's psychological studies were beginning to flourish and develop, an extreme "left" ideological trend again appeared in society. The reactionary literary whore, Yao Wenyuan, alias Ge Mingren [5514 6900 0086] published an article in the 28 October 1965 issue of GUANGMING RIBAO titled, "Is This a Scientific Method and a Correct Way to Study Psychology?" This was a signal of the ideological trend that was to swamp psychology. Under pretense of reiterating class struggle, this article flatly negated the direction of research and the methods of research in psychology in our country. In 1966, in a "letter of objection" to several professors of psychology at a certain university in Shanghai, Yao Wenyuan brazenly labeled the study of psychology as "bourgeois," and vainly attempted to discredit psychology totally. The basic ideas in these two things from Yao Wenyuan were no new goods, but only a vicious expansion of his reactionary notions, which he had put out as "feelings" and "of a class character" in 1959. In the view of Yao Wenyuan and his ilk: 1) psychology meant thinking, and thinking always had a class character; therefore class character was the main and even the sole objective in the study of psychology. Their reactionary logic was that for psychology not to study the class character of man but to study the laws common to the psychology of all mankind was to propagate the rotten psychology of the bourgeoisie, was to make it a part of the "ideology of the bourgeoisie," and therefore it should be overthrown and eliminated. 2) They propagated a brainless philosophy. They absurdly maintained that cases in which our country's combat heroes had gone on to splendid completion of combat tasks despite damage to their cerebrums showed that psychological activities could go on separate from activities of the cerebrum, thereby denying the necessity for psychological inquiry

into the physiological mechanism of the psyche. This was a fundamental denial of the materialist viewpoint that the psyche is a function of the cerebrum. 3) As regards psychological research methods, they fundamentally denied scientific experimental methods, advocating the method of "class analysis" as the only research method. Comrades who know even the slightest bit about the history of psychology know that the independence and development of psychology is inseparable from the use of experimental methods. A denial of the application of experimental methods to psychology constitutes a fundamental denial of scientific psychology.

As the "gang of four" soared to ever greater heights, the study of psychology fell into an increasingly hopeless situation. Using the authority they possessed, they publicly directed that "psychology institutes are not necessary," and abolished our country's sole organization for psychological research. According to the reactionary logic of the likes of these people, psychology was bourgeois, and thus the psychology society was also a society that was lord of the bourgeoisie and was to be smashed. Worse yet, anyone who had been involved in psychological education or research work was guilty and had to be arbitrarily criticized and struggled against, have his house searched and his property confiscated, or be locked up in a "cattle pen." Under the despotic control of the "gang of four," many comrades were accused of crimes they did not commit and were cruelly attacked and persecuted. Comrade Cao Richang [2580 2480 2490], deputy director of the Psychology Institute and deputy chairman of the board of directors of the Psychology Society was persecuted to death. Our nation's psychology studies suffered an unheard of calamity. The damage wrought by the destructiveness of the "gang of four" cannot be estimated. Numerous older psychologists of great attainment were forced to halt their psychological research and education work; young psychologists full of vim and vigor and in the prime of their lives were forced to change their professions, thereby creating an extreme shortage of specialists and serious consequences for the future development of psychology. The loss of library materials and facilities was also huge. The accumulation of 10 years of research data in psychology was entirely destroyed, and psychology books were disposed of as being part of the "four olds." After a half of 10 years, older comrades dared not teach psychology anymore, and young comrades hadn't the faintest idea of what psychology was all about. During the early 1960's, psychology began to show signs of flourishing and developing in our country. Internationally psychology entered a period of 20 or 30 years of rapid growth at this time. Our country's studies of psychology, however, happened to be halted for 10 years during this period, causing an even greater widening of the gap between our country's psychology and that of advanced nations of the world.

At a time when our country's psychologists were placed in the most distressing circumstances, many of them continued to adhere to truth and, in defiance of brute force, managed to struggle tenaciously by one means and another against the counter current for the elimination of psychology. This shows that the broad masses of psychologists in our country, after 17

years of the study of Marxism and education by the party, possess at least some will and determination not to give in to tyranny but to persevere in the defense of science.

4. In 1976, the Party Central Committee under the leadership of Comrade Hua Guofeng, smashed the "gang of four" with one stroke, and on 24 June 1977 the leading comrades in the State Council issued the important instruction, "revival of the Psychology Institute is very necessary." This action ushered in a new springtime for the study of psychology, and began a period of rebirth for Chinese psychological studies. The main task during this period is to determine how psychology can serve the four modernizations.

Within the very short space of 3 years, psychology in our country has made many outstanding achievements. In the construction of organizations, we have revived and strengthened the work of the Psychology Institute of the Chinese Academy of Sciences, have revived and rebuilt the work of teaching and research sections for psychology in normal schools of higher learning, and have revived and developed the work of the Chinese Psychology Society headquarters and that of branch societies in 26 provinces, municipalities, and autonomous regions. In the building of our ranks, in addition to action to return to their profession those psychologists who were forced in former years to change their profession, and to fit them into educational and research work, we have enrolled graduate students into institutes and qualified institutions of higher learning. Furthermore, psychology departments have been established at Beijing University and at Shanghai Normal University, and several other universities are also preparing to set up psychology departments and vigorously train psychological specialists. We have enhanced international academic exchange activities in psychology.

During the 1977 and 1978, the Chinese Psychology Society convened a nationwide psychology planning symposium at Pinggu County in suburban Beijing; at Hangzhou, it convened a nationwide academic conference of psychologists and the second annual academic conference of the Chinese Psychology Society. The broad masses of psychologists were happy to get together under one roof at these conferences. They summarized the lessons of the experiences of the past 10 years and more, talked briefly about current happenings in the development of psychology internationally, exchanged accomplishments in developing research and educational work since the overthrow of the "gang of four," and charted a direction for future efforts.

1. For the development of psychology and educational psychology, they organized cooperative research in every part of the country whose scope and speed of development has been unprecedented. In the areas, for example, of research into numbers concepts and calculating abilities of children from 3 to 12 years of age, study of above average children, and study of the development of speech in children, fairly good preliminary results have been obtained. Case-by-case follow-up methods were widely used in



research, in experiments, in observation, and in investigation. Concrete analysis and experimental studies were launched into "intelligence testing," a forbidden zone ever since liberation. Active research is being conducted and some valuable results have been obtained in the field of educational psychology, specifically on psychological questions about various branches of education, psychological questions about moral education, and psychological questions about modern education methods.

2. In the fields of common psychology, experimental psychology, and engineering psychology, research during recent years has centered on the sense of sight and the sense of hearing. For example, to meet the needs of socialist construction, research is being conducted into the relative apparent brightness function of vision charts for Chinese that is related to the formulation of standards in optics, research into standards for skin color of Chinese, degree of tolerance for skin color memory, and degree of tolerance for color memory for common colors, which is related to color television and color cinematography. In support of the formulation of illumination standards for plants and mines in the country, research has been undertaken into the functioning of vision. To support formulation of standards for noise prevention, research is being conducted into hearing impairment thresholds for ordinary speech. Additionally, research is underway on determining the basic parameters of depth perception in Chinese, and psychological data have been provided for optical instruments and equipment. Some of the aforementioned results have found use in pertinent units, and preliminary results are appearing in production.

3. In the fields of medical psychology and physiological psychology. In recent years in the course of research on the principles underlying acupuncture anesthesia, psychologists have launched research into the psychological factors bearing on acupuncture anesthesia and acupuncture suppression of pain, and have summarized the effects of psychological factors such as suggestion, concentration, and moods. They have also researched changes in human moods through surgical operations, and the relationships among the body's various physiological indicators and biochemical changes. Proceeding from the theory of pain perception, they have researched the biological rhythm of changes in the threshold of pain of the skin as well as the relationship between suppression of pain through acupuncture and certain parts of the cerebrum, such as the relationship of the suppression of pain through acupuncture and the hippocampi. In the field of physiological psychology, exploratory research was done on the neural foundations and biochemical foundations of learning and memory through use of electricity to destroy different parts of the hippocampi or injections of trypsin into the hippocampi to examine the effect on avoidance memory of rats in a dark box, and to demonstrate that the hippocampi plays an active role in learning and memory at an early stage as well as that it is interrelated with protein compounds. In the field of pathological psychology, research was conducted into psychopharmaceuticals with experiments being conducted on the behavior of animals under the influence of hallucinogenic medicinal herbs produced in China. In the field of treatment of mental illnesses, research was done on the function of treatment

by hypnosis and psychotherapy. Research and trials with bio-feedback methods and behavioral therapy were used.

4. Basic theoretical research in psychology has attracted extremely great interest in psychological circles. Fairly noteworthy is criticism of Wilhelm Wundt, which brought 29 papers during the 1978 academic year. Additionally, analytical study and criticism was done on the pertinent activities and thoughts on ideological problems of the Soviet psychologist, Leontev.

In addition to the revival and development of the special committee on educational psychology, the Chinese Psychology Society established in March 1979 a Basic Research Society of the Chinese Psychology Society, a Special Committee on Medical Psychology, and a Special Unit for Sports Psychology. Additionally, it revived the editorial committee for the 'XINLI XUEBAO;' published the XINLI XUEBAO, set up an editing and translation committee for psychological documents, and prepared to revive the 'XINLIXUE TONGXUN' [PSYCHOLOGY BULLETIN]. In order to meet the needs of education, it has engaged in a great cooperative effort to issue the second part of Comrade Cao Richang's "Common Psychology," and has undertaken to revise Comrade Pan Shu's [3582 5486], "Educational Psychology," to write, "A History of Modern Psychology in the Occident," and Professor Zhu Zhixian at Beijing Normal University has also undertaken to revise "Child Psychology," a textbook published in 1962.

"The experiences of history merit attention." Just which of the experiences and lessons of the ups and down of the past 30 years in the course of development of Chinese psychology merit retention?

First, that it is essential that the party's policy of "letting a hundred flowers blossom and a hundred schools of thought contend" be diligently carried out. This is a policy that assures and promotes the flowering and development of socialist culture and science, which is particularly important for psychology, inasmuch as modern psychology has but 100 years of history and is still not sufficiently mature, and its content is somewhat multifarious and lacking in coherence. Thirty years of history amply demonstrates that only through a policy of "letting a hundred flowers blossom and a hundred schools of thought contend" in which diverse schools of thought are allowed and diverse points of view able to freely contend can the academic atmosphere of psychology be enlivened, and the development of psychology be promoted; otherwise, it will come to a halt.

Second, that it is essential, under the guidance of Marxism, to strengthen basic theoretical research work in psychology. The object, task, methods, and the subject matter of psychology all belong to the basic theory of psychology, but of these the central question is the question of the object of the study of psychology, which is the question of just what psychology should study and what it should not study. This ramifies into the direction and the line psychology should follow, and it ramifies into the fundamental theoretical question of whether psychology can exist and

develop as an independent discipline. The several ups and downs of the past 30 years in psychology center around a basic divergence on this question. Whenever academic freedom is violated as for example when "the class consciousness of different classes of people" as the sole object or the main object of study for psychology becomes the dominant ideological trend, psychology has been treated coldly, has withered and failed, and has come to a halt. When matters are otherwise, psychology becomes dynamic, advances, and grows. Unless this problem is thoroughly resolved, when next the class struggle club strikes in an extreme left ideological trend, psychology will again follow the same old disastrous road.

Third, it is essential that it be closely related to the actual requirements of socialist construction. In the final analysis, whether a branch of learning flourishes and develops depends on whether it is able to solve real problems and be put into practice. If a branch of learning cannot directly or indirectly serve a practical purpose, it will lose the value it possesses for socialist construction. The experience of 30 years has also fully demonstrated this point, i.e. when psychology was flourishing and developing, those were the times when it was making fairly numerous contributions to socialist construction. Whichever branch of psychology made the greatest contributions to socialist construction was the one that had the most rapid development and flourished most. At present, psychology has to serve the realization of the four modernizations. No matter whether in education, medical treatment, or sports, or productive labor, its central task remains the improvement of efficiency. Of course, improvement in efficiency is not the task of psychology alone; psychology is but one method among many, but it is one that cannot be omitted. The mission of us psychologists is, through close cooperation with other branches of learning, to make psychology play the greatest role in the process of serving practice.

Fourth, it is essential, if psychology is to be able to serve in the realization of the four modernizations, that efforts be made to make psychology itself realize modernization. Since the study of psychology possesses a high degree of complexity, it must employ advanced world techniques and methods in order gradually to explore the mysteries of psychological activity. During the past 10 years, a great take-off has occurred in international scientific techniques with new accomplishments steadily appearing. We must actively study them, and we must both absorb large amounts of advanced foreign techniques in order to modernize psychology rapidly, and diligently summarize our own nation's ancient and modern psychological ideas and experiences so as to build gradually a modern psychology that is indigenous in spirit.

In looking back at the past and ahead at the future. China's psychology has bright prospects and great hope. As the chairman of the board of directors of our Chinese Psychology Society, Comrade Pan Shu, said in 1978 in a speech before the second annual meeting of the China Psychology Society: "Let us unite, liberate our thoughts, and advance bravely toward the victorious completion of the lofty goal of modernizing our country's study of psychology."

#### BIBLIOGRAPHY

[Not included with this translation]

## NATIONAL DEVELOPMENTS

### THIRTY YEARS OF THEORETICAL PSYCHOLOGY IN CHINA

Beijing XINLI XUEBAO [ACTA PSYCHOLOGICA SINICA] in Chinese No 3, Oct 79  
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[Article by Che Wenbo [6508 2429 0590] of Jilin University, and Guo Zhanji [6753 0594 1015] of Jilin Normal University: "Thirty Years of Basic Theoretical Psychology in China"]

[Text] As our country enters a great historical time of change, it is extremely important that we allow ourselves a rough summary of experiences during the past 30 years in basic theoretical research in psychology, and a look ahead at the future prospects for basic theoretical research. This will help us, with the guidance of Marxism and Mao Zedong Thought, to adhere to full liberation of thought, to exercise academic freedom, to further strengthen basic theoretical research, to successfully realize the modernization of psychology itself, and more effectively to serve socialist modernized construction.

#### Historical Review

Basic theoretical research is a major aspect of scientific research in psychology.

During the past 30 years, Chinese psychologists have, in the course of building Marxist psychology, done much theoretical research work from which they have obtained definite results and learned many valuable lessons of experience.

The past 30 years may be generally divided into the following five periods on the basis of the development of basic theoretical research in psychology in China:

The first period from the establishment of New China in 1949 until 1957. This was the founding period for basic theoretical research in psychology in China. During this period, psychologists experienced the study of the pertinent philosophical writings of Comrades Lenin and Mao Zedong, participated in the campaign of thought reform for intellectuals, studied



Pavlovian theory and Soviet psychology, launched some exploratory experimental research, formulated a 12 year (1956-1967) plan of scientific research, set up psychological research organizations, and published specialized periodicals and books dealing with psychology. In these ways, our country not only lay a preliminary political foundation for the development of basic theoretical research in psychology as well as a philosophical and physiological foundation for it, but also provided the essential tools and fields in which to work.

The second period was from the anti-rightist rectification campaign of 1957 until 1959. This was a period in which basic theoretical research in psychology began to develop again after having suffered setbacks. During this period, in response to a call from the Chinese Psychology Society, the most pressing and most universal psychology-related problems in production and in education in our country were tackled in an effort to solve them within 3 years. Outstanding achievements were made in this effort, and a debate on the strengthening of the link between theory and practical problems was launched. Everyone unanimously agreed that it was necessary to make the strengthening of the link between theory and practice the principle direction in which basic theoretical research in psychology would go in the future. Subsequently, necessary adjustments were made in the system of organization of research organizations and in courses offered in psychology curricula, and appropriate revisions were made to the "12 year development plan for psychology." Next, a counter current appeared that choked psychology in our country. This was the campaign of criticism against psychology created in 1958 by "famous professors," and "theoretical advisors" at Beijing Normal University. This campaign of criticism was fundamentally wrong in both its general orientation and in its overall methods of operation. It violated Marxism and the policies of the party, and it was also a manifestation of "leftist" ideology that ran rampant for a time in the field of psychology. It created an odious effect on the development of psychology in our country. Because the Party Central Committee discovered the error of this campaign of criticism in time and corrected it, penetrating discussion and contention was resumed on several basic theoretical questions of nationwide scope such as the object, nature and methods of the study of psychology. Some divergences in views were narrowed, and the problems being debated were better clarified. In the year 1959 alone, more than 20 articles about basic theory were published in XINLI XUEBAO. Not only was the quantity large, but the quality was also improved. Some people have said that this was a year of bumper harvests for basic theoretical research in psychology, and a year that is hard to forget.

The third period was from 1960 until prior to the Great Cultural Revolution of 1966. This was a period in which basic theoretical research in psychology flourished in China. From the time of the Second National People's Congress in 1960, when everybody enthusiastically responded to the call of the China Psychology Society to "study Mao Zedong Thought and raise scientific levels in psychology," and because of resolute implementation of the party's policies of letting a hundred flowers bloom and a hundred schools of thought

contend, as well as its policy of linking theory and practice, basic theoretical research in psychology enjoyed many distinct achievements.

At the third nationwide academic conference, at affiliated conferences in large regions, and at annual conferences in each province, large numbers of papers were read that summarized discussions that had been launched in 1959 by psychologists on the question of the object, nature, and methods of psychology. Papers pertaining to basic theoretical research numbered more than 60 in 4 years. Some units (such as the normal institutes in Kaifeng and Xian) compiled special volumes titled, "Mao Zedong On Human Psychology." This was very beneficial for the psychologists of our country in the conduct of basic theoretical research in psychology under the guidance of Mao Zedong Thought. It may be said that a flourishing panorama appeared throughout the land in basic theoretical research in psychology. But at the same time there also appeared some signs of a throttling of psychology. The reactionary literary whore, Yao Wenyuan, had repeatedly stuck his vicious hand into the world of psychology long before the advent of the Great Cultural Revolution, had confused public opinion, created chaos, and throttled psychology. This was manifested principally on two questions: one was his borrowing of the opportunity created by discussion in Shanghai psychological circles of the question of class nature of human psychology to dish out a scurrilous article in XINWEN RIBAO titled, "Layman Newspaper Reader Talks About 'Psychology'." Second was his use of opportunity provided by discussion in academic circles of experimental methods to publish a malicious article under the pseudonym Ge Mingren [5514 6900 0086] in GUANGMING RIBAO titled, "Is This a Scientific Method and a Correct Way to Study Psychology?" The slanders and calumnies of these articles were not only harbingers and signals of the strangulation of all psychology that would later be done by the "gang of four," but also foretold greater disasters for psychology in the future.

The fourth period was from the onset of the Great Cultural Revolution in 1966 until just before the "gang of four" was smashed in 1976. This was the period in which Lin Biao and the "gang of four" savagely destroyed China's psychology, including its basic theoretical research. As soon as this period began, the "malicious writings" of Yao Wenyuan were unexpectedly used against psychological circles as standards for falling into line and demarcation. All who held divergent views were labeled as "bourgeois intellectuals," "reactionary academic authority," or "counterrevolutionaries," and willfully excluded or attacked. They totally denied the work of psychology of the previous 17 years, besmirched psychology as being a "pseudo science" that is "nine-tenths useless and one tenth distortion." They threatened that "psychology has to be utterly smashed to bits," and then they forced the disbandment of China's sole psychology research institute and all teaching and research sections (or units) for psychology in every specialized institute and school; they put an end to all psychology curricula, demolished laboratories, ordered a ban on reading and even burned pertinent data in libraries; the broad masses of psychologists were compelled to change their profession, with quite a large number being sent into long term political exile and some others suffering cruel persecution. In this way, not only

was psychology eradicated, but the psychological ranks were dispersed. But while the "gang of four" was on the rampage, quite a few psychologists were actively studying pertinent Marxist expositions on psychology and firmly believing in research on basic psychological theories. For example when an article written by the psychology teaching and research unit of Jilin Normal University and titled, "The Psychological Ideas of Wang Chong" was about to be published, some people villified it saying that psychology was the preserve of idealists and that all references to "psychology" in the text would have to be entirely deleted before the article could be published. They immediately and strenuously refused, pointing out as well that such absurdity contravened Lenin's regard for psychology as a science, which was abundantly demonstrated in the dialectical materialist theory of knowledge. They staunchly maintained that they would rather not publish the article than delete references to psychology. From this may be seen that even during the days of the rule of the "gang of four," some comrades dared to resist and unswervingly undertook basic theoretical research work.

The fifth stage was following the smashing of the "gang of four" in 1976 up to the present. This is an unprecedentedly dynamic period in China's basic theoretical research in psychology. Thanks to the loving care of the party, psychology was politically liberated during this period, was organizationally revived, and its work greatly developed. A new springtime in psychology had truly been welcomed in. Acting on the instructions of Chairman Mao and Premier Zhou, while they were still alive, the China Psychology Society formulated plans for basic theoretical research, established a China-wide basic theoretical research society for psychology, approved trial regulations for the research society, decided that the current emphasis of research should be on criticism of Wilhelm Wundt and on the writing of "Thirty Years of Chinese Psychology" and a history of psychology, and brought into being a leadership organization to which Pan Shu [3382 5486] and Chen Yuanhui [7115 0337 2547] were elected as director and deputy director. Subsequently, some provinces and municipalities also set up basic theoretical research units in psychology. These actions lay the organizational foundation for our country's future basic theoretical research efforts in psychology. Basic theoretical research in psychology also had another new beginning. Both the quality and quantity of papers presented at the two nationwide academic conferences held in 1978 were clearly better than those presented at the first annual conference in 1963. The number of papers had increased nine fold; attention had been given to applications of practice; content was substantive; and they were definitely persuasive. Particularly noteworthy was a series of views and proposals from Comrade Pan Shu on the strengthening of basic theoretical research, and his having taken the lead in numerous theoretical research projects. The Basic Theoretical Unit of the Psychology Institute published a special edition titled, "Commentaries by Marx, Engels, Lenin, Stalin, and Mao on Human Psychology," as well as several tens of thousands of words of criticism of Wilhelm Wundt. Comrade Xu Liancang [1776 5114 0221] sketched the course and general situation regarding basic theoretical research in psychology in Austria. The Information Office of the Psychology Institute also made a special

survey of trends and achievements in the field of basic theoretical research in psychology during recent years in the Soviet Union and western countries. All these events gave impetus to our own country's basic theoretical research work in psychology and our critique of Wilhelm Wundt.

The principal accomplishments of Chinese basic theoretical research in psychology during the past 30 years have been as follows:

1. Under the instruction of the party and through the tempering provided by the study and practice of Marxism and Mao Zedong Thought, the broad masses of psychologists reformed their political standpoints and their world outlooks to become a part of the working class and, as a result of positive and negative experiences, they made clear the importance, the principal mission, and the way to developing basic theoretical research in psychology. This provided the essential foundations of political ideology and theory for the further development of Chinese basic theoretical research in psychology.
2. During the past 30 years, Chinese psychologists have conducted much theoretical research and experimental research and have compiled, "Common Psychology" (edited by Cao Richang [2580 2480 2490]), "Educational Psychology" (edited by Pan Shu), "Child Psychology," (edited by Zhu Zhixian [2612 2535 6343]) as well as numerous other education materials. They have published, XINLI XUEBAO, XINLIXUE YANJIU DONGTAI [Trends in Psychological Research], XINLI KEXUE TONGXIN [Psychology Science Bulletin], and XINLIXUE CANKAO ZILIAO [Psychology Reference Materials]. They have also issued hundreds of papers and data. This work has laid a foundation for future basic theoretical research both for the solution of practical problems and for the enrichment of psychological theory.
3. The Chinese Academy of Sciences has established a Psychology Research Institute and various large specialized schools and institutions have established teaching and research offices (or units) in psychology. Beijing University and Shanghai Normal University have established psychology departments, and several normal institutes and schools have set up specialized fields of study in psychology. The Chinese Psychology Society has set up a society for basic theoretical research. The teaching and research ranks in psychology have steadily expanded and improved, to provide the essential organizational preparation, research forces, and material conditions for our country's basic theoretical research in psychology.

Of course, in our basic theoretical research in psychology, numerous problems and shortcomings continue to exist. The level of theoretical understanding and the vocational level of numerous psychologists is still not sufficiently high, and their modes of thinking are, to a certain degree, one-sided; consequently, not only are the numbers engaged in basic theoretical research low, but their quality is also insufficiently high. Additionally, as a result of inability to fully implement the principle of linking theory to practice, they have followed some tortuous roads in their research, and tendencies to become separated from reality or to ignore theory have appeared.



Particularly as a result of the extreme left line of Lin Biao and the "gang of four," because there was no academic freedom and no way to carry out the policy of letting a hundred flowers bloom and a hundred schools of thought contend, our mentality fell into a state of rigidity, and we often lacked the attitude of one dividing into two in regard to foreign psychology. We also lacked the courage to explore the so-called forbidden zones and we lacked the spirit for daring to innovate. We did not do a good job of combining study, criticism and continuity.

#### Research on Several Major Theoretical Problems

For the past 30 years, psychology circles in our country have explored and conducted research on a series of basic theoretical problems. A general exposition of several major theoretical problems is given below:

##### (1) The Problem of the Relationship Between Psychology and Pavlovian Theory.

Shortly after the founding of the People's Republic and during the process of setting up scientific psychology in our country, the China Psychology Society proposed a policy for professional reform under the guidance of Marxism and founded on Pavlovian theory. On the point of the guidance of Marxism there was no dissent, but different views existed as to the issue of whether Pavlovian theory should form the basis for reform of psychology. This involved not only views on the nature of Pavlovian theory, but also involved the problem of how to understand the relationship between the psychological activity and the higher nervous activity of people.

On the issue of the nature of Pavlovian theory itself, there were two different views at the time. Some individuals held that philosophical nature of Pavlovian theory belonged in the category of mechanical materials. Because "he [Pavlov] still sticks to the old mechanical materialist view of neurology," consequently "the errors in psychology are produced by the mechanical materialist view of nervous activity...this is the reason that psychological questions have gone unresolved for a long time." Consequently, Pavlovian theory should not form the foundation for psychological research; "the theory of reflection must be put into effect." The majority of Chinese psychologists maintained that Pavlovian theory was compatible with the principles of dialectic materialism, and that this theory was different in nature from the mechanical materialism of the behaviorists. Pavlovian theory provided a natural scientific foundation for the Marxist theory of reflection, and it was a powerful weapon for doing battle with various idealistic psychologists. Thus, in the study of psychology, implementation of Pavlovian doctrine did not violate the theory of reflection; it was compatible with the theory of reflection.

In actual practice this raised two problems. The first was the problem of the scientific nature of Pavlovian doctrine itself. The other problem was that even though Pavlovian theory was scientific and correct, should

Pavlovian theory become the foundation for reform policy? Though related, these two problems were also distinct. However, the two were lumped together at the time and it was not possible to discuss each of them separately.

During the course of the Great Cultural Revolution and under the influence of the extreme left thinking of Lin Biao and the "gang of four," some people were doubtful about Pavlovian theory, even to the point of maintaining that it "had long since become obsolete," and they would not dare discuss it. Following the smashing of the "gang of four," and after study and discussion, a group of people maintained that even though Pavlov could not avoid, either in his research or in his pronouncements, the influence of old materialism, this did not tarnish Pavlovian theory. It must be recognized that Pavlovian theory was an important historical stage in the development of neural physiology. He pioneered a new road of research into higher nervous activity, and established the theory of higher nervous activity. He also provided some scientific data for the correct understanding of the physiological mechanisms involved in human psychology. For this reason, use of Pavlovian theory to analyze and explain psychological phenomena is correct and necessary. At a specific stage of historical development, it was possibly the most important data. In this sense, the proposal at the time of a professional policy of "using Pavlovian theory as the foundation for the reform of psychology" served a positive purpose.

However, it must also be realized that as a result of the influence of the Soviet bicameral conferences of the 1950's, psychological circles in our country really did regard Pavlovian theory as the "supreme summarization," with Pavlovian theory coming to be used excessively to explain all phenomena.

Consequently, it is wrong to maintain a nihilist view of Pavlovian theory, while at the same time it is equally wrong to regard Pavlovian theory as the "ultimate truth." In particular, with the lightning development of neuro-physiology during the past 10 to 20 years, it is evident that resting psychology solely on Pavlovian theory is not adequate. We must give serious attention to and use all the scientific products of neuro-physiological research such as on the question of the structure of brain stem reticulation, the question of neural regulation of body fluids, the question of the relay of messages [4499 6051 0278 6677], the question of coordination centers in the cerebral cortex, the question of experiments on brain separation, and the question of the brain's neuro-chemical mechanism. Only in this way can our teaching and study of psychology not be limited to the level of Pavlovian theory, but move ahead to reveal the neuro-physiological mechanisms through molecular biology, neuro-physiology, and neuro-chemistry.

During the period immediately following the founding of the People's Republic, psychologists held widely divergent views about the question of the relationship between human psychology and higher level nervous activity. Two polarized views existed. One was the "theory of identicals," which held that human psychological activity was the same as higher nervous activity and that human psychological activity and the salivation activity

of dogs was not essentially different. The other view was the "theory of opposites," which held that human psychological activity and higher nervous activity were two distinct and diametrically opposed activities, and that higher nervous activity could not be used to explain psychological activity, which was on a phenomenon on a higher level. Many psychologists did not agree with these two polarized views, but opinions were not unanimous. Following repeated discussions, however, everyone's views became somewhat closer. The majority maintained that it was necessary to maintain the dialectic unity of physiology and psychology. That is to say that though psychological activity and higher nervous activity were neither in opposition nor identical, neither could they be separated nor isolated. They were both distinct and related. Their differences lay in higher nervous activity being the motion of matter in the singlet state of the motion of life, while psychological activity is the pattern of social activities and the pattern of life (physiological) activities that have been mutually transformed into a composite higher motion of matter, which is to say that the two are not forms of the motion of matter that are the same in type or character. Their relationship lay in higher nervous activity being the material basis for psychological activity, while psychological activity is the principal manifestation of higher nervous activity. Therefore, in a certain sense the two are different aspects of the same thing and are identical in time and space, because psychological activity is a higher nervous activity that uses reflex methods to reflect objective reality and produce consciousness. Of course, there is also higher nervous activity that uses reflex methods to reflect an organism's internal situation. Under this circumstance, it does not produce consciousness and is not psychological activity.

## (2) On the Question of the Object and the Mission of the Study of Psychology

Every field of scientific study has its own specially appointed object for study and field for exploration. An accurate understanding of the object of the study of psychology is not only a real requirement for the development of the study of psychology, but is also the primary requirement for research in the study of psychology.

The so-called object of psychology is nothing less than the special conflicts that the study of psychology seeks to resolve; i.e. the special characteristic that distinguishes it from other sciences in the issue of what it researches. The so-called mission of psychology is the prescribed specific content that characterizes the object for study in psychology, i.e. the work that must be done in finding solutions to the objects of study in psychology.

The wide differences in opinion that have existed for several score years among psychologists in our country about the object of psychological research has frequently resulted from a lack of unanimity in understanding the nature of psychology itself. Consequently, there are two principal different schools of thought in our country about the object of psychology. One faction is the substance faction. They maintain that since it is the substance of the

psychology that is prescribed, the object of the study of psychology should be, therefore, principally the substance, with the study of psychological forms being secondary. In their view, the substance of the psychology is the human knowledge, viewpoints, and thought systems formed out of reflection of reality, and the social effects of human behavior and actions. In a class society, "there can be no such thing as a common psychology shared by everyone." The study of psychology can only study "class psychology." "If it is not studying the psychology of the proletariat, it is studying the psychology of the bourgeoisie." Thus, the object of research and the mission of the study of psychology lies not in exploring the psychological laws common to all mankind but in studying the special laws specifically formed by communism in new men under conditions of socialism in our country.

The other school is called the process school (or structural school). Most psychologists in our country agree with the advocacy of this school. They hold that the psychology is a special reflective process; therefore, the principal object of study in the study of psychology should be psychological formations, i.e. the reflective process. The substance of the psychology and the form of the psychology are integrated, to be sure, and the substance of the psychology determines the form of the psychology. However, the form of the psychology also has a relative independent and stable nature, and can be an object of special study. In their view, all psychological activity may be divided into three parts: its content, its process, and its mechanism (or physiological mechanism). For example, thinking or pondering a problem is its content; the analysis, synthesis, abstract reasoning, and summarizing is its processes; and the relationship among stimulation, control, and induction is the physiological mechanism of thought. Psychologists principally study not the substance of the psychology but man's process of reflecting objective reality, how man comprehends objective things, forms a reflection of the objective world, and the formation of his own individual traits from out of his comprehension of the objective world and practical activities. In other words, the study of psychology proceeds from the angle of reflection and forms to a study of individual and psychological processes, to a study of the psychological laws common to all mankind and to special psychological laws. This is the special characteristic that separates the study of psychology from all other sciences so far as the object of study is concerned.

Many people maintain that the principal object of the study of psychology is not study of the substance of the psychology, because the substance that reflects on the psychology such as knowledge, viewpoint, and thought system, as well as the social outcome of behavior are the objects of study in historical materialism and other pertinent sciences. It is extremely clear that if the study of psychology does not undertake study of the process of reflection in the brain, or does not undertake study of the function of the brain as they bear on consciousness, but persists in pursuing an exploration of the substance of the psychology, the study of psychology will amount to the study of logic, or philosophy, or the history of thought, thereby eliminating the special objects for study and mission of the study of



psychology. Of course, to advocate that psychology principally study psychological forms or the laws of reflection processes is not to brush aside the substance of the psychology entirely; on the contrary it is also necessary to study or become involved with the conditions for the formation of the substance of the psychology, the way in which it develops, and its effect on the reflection process.

Many people feel that the object of the study of psychology should not be limited only to the study of individual and special class psychology. True, man is the sum total of social relationships, and once man's consciousness begins, it is a product of society. Man's consciousness also always bears the influence of class interests and it carries the "brand" of a definite class. Man, however, is also an "active natural entity." Man's psychology is the product of a long period of historical development in the natural world, and of the functioning of the natural substance that is man's brain. Therefore, class is neither the totality of man's psychology nor is it the sole element that determines the development of man's psychology. In fact, some actions bear the influences of class and others do not. Even if laws universally applicable to psychological activities are revealed in psychological activities influenced by class, they cannot be entirely attributed to individual or class functions. For example, if following a raising of his political consciousness a worker's work efficiency improves and he accomplishes wonders, this is a manifestation of his class character, but it is also a manifestation of the universal law that when "consciousness is dynamically concentrated, creative actions may be easily educed." It cannot be attributed solely to class character. It may be seen that the generally applicable psychological laws and the special psychological laws of class are by no means diametrically opposed but are dialectically unified. General psychological laws are always manifested in and function within the special psychological laws, and a study of general psychological laws can also enable us better to study the special psychological laws of class. Those who espouse only the study of "the new type workers" in our country's existing society and the training in communist individuality of the younger generation, not only restrict the scope of the object of the study of psychology, but also confuse the mission and the object of the study of psychology. Of course, when we stress the importance of study of generally applicable laws of psychology, we certainly do not want to ignore study of personality and special laws of psychology, because personality is the principal subject of psychological activity and the regulator of psychological activity. Personality always affects, in one way or another, the course of people's psychological processes, and reflects people's reflections of reality. Looked at from the viewpoint of modern systems theory, all systems objects possess a totality and non-additive properties. Every object is a totality constructed from a definite system structure and its interrelationships. This conforms with the principles of dialectic materialism. According to this theory, it is essential in psychological study to set up a total point of view with no lopsided emphasis on the study of a single aspect. Scientific psychology must study both the generally applicable laws of psychology, and it must reveal the special laws of psychology.

### (3) On the Question of the Scientific Nature of Psychology

It is extremely important to clarify the scientific nature of the study of psychology so that we can correctly master the object of the study of psychology and apply appropriate research methods to launch effective research work.

The character of every science is determined by the special nature of its object. People generally divide science into three broad classes on the basis of differences in the nature of their scientific objects: natural science, social science, and putative science. During the past several decades, along with the lightning developments in science and technology and the ever more subtle divisions of labor, each branch has gradually become an independent science and an earth-vaulting science whose function becomes of increasing importance. Examples include biochemistry, geophysics, geochemistry, biophysics, and physical chemistry.

To just what category of science does psychology belong? There have been five different views about this: 1) psychology is a social science; 2) psychology is a putative science; 3) psychology is an intermediary science akin to the social sciences; 4) psychology is an intermediary science akin to the natural sciences; and psychology is an intermediary science (or a frontier science, or an interconnecting science, or a world-vaulting science, or a bridge science) that is not akin or inclined in any special direction. In addition to these categories, some people have called it a composite science.

At the present time, most psychologists in our country agree that psychology is an intermediary science. Their main points of argument are: 1) man is a social entity and he is also a natural entity; 2) the human brain, which acts as the organ of the psychology, is a highly developed special thing and a socialized thing unto itself formed through labor of a social character, but the human brain has not lost its own inherent natural character; 3) the substance of the human psychology is rich and varied; it is a thing that includes a social existence and the natural world. Even though the human reflection of natural reality is always conducted under specific social conditions, and even though this human reflection possesses a distinct social character, one cannot assume because of this that the reflected substance and object have only social character and are without natural character; 4) human psychological processes have no class character; they are shared by all mankind and mostly the methods of natural science are used to study them. Human personality, however, is the sum total of social relationships, and is studied, for the most part, through the use of the methods of social science; 5) human psychology is under the restraint of both social laws and of natural laws, and we must master both the functions of the brain and study how ambient reality is transformed by the brain into consciousness by the subject. For these reasons, psychology is an intermediary science in between the social sciences and the natural sciences. Because it does not consist mechanically of one part social and one part natural, and is

not a melange, it is impossible to see that it is mostly one and less of the other. In the case of physical chemistry, for example, it is not one-half physics and one-half chemistry. The phenomena that physical chemistry explains are those that cannot be explained by either physics or by chemistry alone, but require use of a new frontier science--physical chemistry--to explain them. It may be seen then that at the present time no adequate reason exists for saying that the intermediary science, psychology, should be akin to one science or another. As regards the branches of psychology, inasmuch as the specific aspects of study vary, some may be studied as social sciences and others as social psychology; still others may be studied as natural science as is the case with neuro-physiological psychology. This is entirely permissible.

Some people disagree with simply placing psychology among the social sciences, because those who advocate putting it with the social sciences frequently overemphasize the social nature or class nature of human psychology to the neglect of the nature, character and the function of the brain as well as the significance of the laws of higher nervous activity on human psychology. Thus, not only may this lead to a confusion of the study of psychology with historical materialism, ethics, esthetics, and logic, but may also influence the smooth development of psychology along the correct road.

Many people disagree with the classification of psychology as a natural science, because those who advocate classifying it as a natural science frequently overemphasize the special significance of the natural and the study of the neuro-physiological mechanisms on human psychology while ignoring the importance of social restraint and the laws of social development on human psychology, thereby leading to the elimination of psychology from another quarter.

Many people disagree with terming psychology a putative science. Those who hold these views are actually confusing psychology and thinking as being the same thing, thereby easily shrinking the object of study for psychology and confusing the boundaries of psychology and logic.

Many people also do not agree with the delineation of psychology as an intermediary science akin to some other. Because people who hold this view frequently pay little attention to understanding the content of intermediary science, for them it is not an intermediary science that is akin to two others. Of course, the real reason some people say this is that they consider psychology to be a natural science or a social science in a different form.

#### (4) On the Question of Methods in Psychology

Inasmuch as views among psychologists have varied during the past 30 years about the object, mission, and nature of psychology, there has consequently been quite a bit of argument about the methods of psychological research.

On the question of class analysis, some people maintain that this is the most universal and most fundamental method in psychological research. In their view, the consciousness that is the object of psychological research is a product of society and it possesses a class nature in a society that has classes. Thus, only through the methods of class viewpoint and class analysis can the social essence and the objective laws of its development in human psychology be revealed. But most people do not agree with this viewpoint. They hold that it is necessary in psychological research to pay attention to the carrying out of class analysis, but that there is no need and no possibility in the total study of the content of psychology to apply the methods of class analysis universally, because the methods of class analysis are the methods of materialist dialectics concretely applied to the resolution of social class struggle. In places where class struggle exists, it is necessary to apply the methods of class analysis to study problems that occur there. Very clearly, psychology is neither a study of class relationships nor a study of class ideology, but a study of that most complex phenomenon--the mind, in which some matters are affected by class and others not. Thus, one cannot promiscuously apply class analysis as a universal research method in psychology. In fact, class analysis will not work in most research on the psychology of children, and use of class analysis on sense perception and general perception is not satisfactory. Class analysis, however, may be used as a principal in guiding psychological research work. For example, in studying some higher level psychological phenomena, personality theories, criminal psychology in youth, and other socio-psychological problems, care must be given to observation and analysis from the viewpoint of class and class struggle. It is helpful in uncovering the real nature of these problems and the reasons they occur.

As regards experimental methods, they are inextricably bound up with the methods of class analysis. Those who espouse universal application of the methods of class analysis in psychological research are extremely opposed or deprecate experimental methods. In their view, experimental methods are not scientific. Application of experimental methods to psychological research not only cannot solve problems, but may lead to errors of naturalism. The majority of psychologists in our country feel that the principal method to be used in psychological research is not the method of class analysis but experimental methods (including experiments in laboratories and natural experiments). In their view, the principal object of psychological research is not the content of consciousness but the reflection process; consequently, we must make the experimental methods, so widely used in the social sciences and the natural sciences, a principal methods for use in research in this intermediary science of psychology.

The history of modern psychology attests that only through the use of the experimental method can psychology branch out of philosophy to become an independent science. The many laws that psychology has discovered such as the threshold of sensory perception, persistence phenomena in perception, forgetting curves, "receptive fields," and the optimum years for children to study have all derived from experimental research. The development



of modern science and technology with the use of sophisticated equipment and devices in research such as micro electronic technology and electronic computers will play an increasingly important role in probing and studying psychological laws. The reactionary literary whore, Yao Wenyuan, viciously attacked experimental methods in psychology, labeling them, "isolated and abstract methods," "idealistic and metaphysical methods," and "anti-science methods." He has been exposed as trying to throttle psychology and bending every effort to cripple psychologists in order to attain hidden ulterior motives.

#### (5) On the Question of Motivation in the Development of Human Psychology

In the early 1960's psychologists launched a discussion of this question that has continued to this day.

In the course of their discussions, everybody unanimously maintained that the motivating force in the development of human psychology was conflicts within the psychology. But everybody had a very different view of just what constituted an internal conflict in the psychology. There were three principal views:

Some people maintained that conflicts between the subjective and the objective were the internal conflicts within the development of the psychology. In their view, the motivation in the development of the psychology was not the so-called "internal causes," i.e. conflicts within the subjective world, but rather conflicts between the subjective and the objective. With the resolution of each conflict, the human psychology developed a little. If "objective factors were to be removed and purely subjective factors came to be the conflicts studied by psychology, that could lead to various idealist situations in which the psychology was unrelated to the objective world, or, at very least, one would sink into a mechanical 'mirror-like' theory of reflection."

Still others maintained that "recognition" and "response" is the internal conflict that develops the human psychology. In their view, recognition is the subjective form created by the stimulation of the subject by the object, while the response is the action taken in response to the influence of the subject. This encompasses both a direct role of organism toward the objective environment and outward motion of the subject, and it also includes a change and readjustment in the internal state of the subject itself. Recognition and response are both different and related. They rely one upon the other, and under certain conditions interchange. The opposition and the unity of recognition and response creates special internal contradictions within psychological phenomena.

The majority of people maintained that the demands of environment and education placed on children and borne by them, plus the conflicts among the levels of psychological development when a child is learning are the internal conflicts of psychological development and are also the true motivation

force in the development of the psychology. Those who held these views expressed themselves in slightly different ways, but basically they stressed the reflection of the old and the new or conflicts among requirements. Specifically, internal conflicts in the psychology are produced in the process of the interfunctioning of the subject with objective things. The objectively existing reflection is one aspect of an internal psychological conflict. It is normally revealed in new requirements brought about by the requirements placed on the individual by environment and education (tasks, problems, difficulties). These new requirements (such as intent, goals, enjoyment, ideals, beliefs) are frequently a new aspect and a dynamic aspect of internal psychological conflicts. Finally, some psychological levels or psychological states are another aspect of internal psychological conflicts. They are the result of past reflection activity, and they include the level of understanding and the personality characteristics formed from a person's practical activities. This subjective internal state is usually an old and fixed part of internal psychological conflicts. The opposition and the unity of new requirements and among existing levels or states structures the internal psychological conflicts in people and constitute the internal reasons and motivation for the development of the human psychology.

Those who hold this viewpoint maintain that to characterize conflicts between the subjective and the objective as internal psychological conflicts is not precise enough. Because conflicts between the subjective and the objective are the foundation produced by the psychology, it includes psychological conflicts within it, but it is not the equivalent of internal psychological conflicts. For example, living things have a conflict between the organism and the conditions for life, which is merely an external conflict in the growth of the living thing. It is heredity and variation that are its internal conflicts. If one were to say that subjective and objective conflicts are conflicts within the psychology, it would be necessary to say that the objective world is a conflicting part of the psychology and that would clearly be dangerous to do. But if one says that subjective and objective conflicts are conflicts within the psychology, then what are the external conflicts of the psychology?

To suggest that "recognition" and "response" are internal psychological conflicts is not proper either. "Recognition" and "response" are indeed a pair of conflicts, but not the principal internal conflict. That is because if recognition is understood to be the beginning extremity of reflection and response is understood to be the end extremity of reflection, according to the theory of reverse conduction, there may be mutual conflicts between the two, but more importantly this conflict is a conflict among two links of reflection and not a major internal conflict of total psychological phenomena. The problem still lies in the two concepts of recognition and response not being precise enough. Do they signify only conflict between the beginning and the end of reflection? Or do they signify a conflict between recognition and practice? If it is the latter, then it clearly exceeds the scope of internal psychological conflicts.

Most recently Comrade Pan Shu introduced the research results on the question of psychological conflicts. He maintains that conflicts universally exist, and that man's various psychological activities likewise contain conflicts. Human psychological activities may be divided into the two broad categories of recognition and intention. Contradictions exist within recognition and intention themselves. An incompatibility exists between intentions and recognition, which is to say there is a conflict. Psychological activity possesses selectivity, and sometimes two recognition acts want to come forth at the same time and a selection is required; thus a conflict between the two is produced. The same is true of intentions. Some times two intentions spring up at the same time requiring the selection of one of them; thus a conflict between the two is produced. He pointed out that the source of psychological conflicts lies in the conflict between the practice of human existence and the objective world. The way to resolve the conflict is through living and practice. Many comrades felt that Comrade Shu's views on psychological conflicts are a new understanding meriting serious attention.

#### (6) On the Question of the Criticism of the Psychology of Wilhelm Wundt

During the past 30 years some research work in the history of psychology has been launched for the purpose of advancing the reform of psychology and building a Chinese psychology system. From the founding of the People's Republic up until the onset of the Great Cultural Revolution, this centered principally on criticism of various modern schools of psychologists such as the structuralism, behaviorism, gestalt psychology, Freudian psychoanalysis, idealist sense organ physiology, the educational psychology of E.L. Thorndike, pragmatic psychology and modern bourgeois social psychology. Some research was also conducted on the history of Chinese psychology and on the history of occidental psychology in ancient times.

By way of commemorating the hundredth anniversary of Wilhelm Wundt's founding of the first psychology laboratory, to summarize historical experiences in recent psychology, to give impetus to the launching of psychological research work in our country, and to establish gradually a theoretical system for psychology in our country, psychological circles in our country began last year to launch a widespread critique of the psychology of Wilhelm Wundt.

At the All-China Special Academic Conference on Psychology held in Hangzhou in 1978, a delegate from the Wundt criticism unit of Beijing municipality presented, "Several Points of Explanation on the Criticism of Wundt Issue" in which the significance of the criticism of Wundt, and the major problems with the psychology of Wundt were given exposition, and the preparation of the materials for the criticism of Wundt was briefly explained. Comrade Pan Shu emphasized that the criticism of the psychology of Wundt must give attention to the following three aspects: 1) the matter of the social history, background and ideological foundation that produced the psychology of Wundt; 2) the matter of Wundt's psychology system (including its object, content, methods, mission); and 3) questions about the effects of Wundt's

psychology on the development of psychology subsequently. At the conference, Comrade Chen Yuanhui made a report titled, "Critique of the position of Wilhelm Wundt in the History of Philosophy and in the History of Psychology," and other comrades spoke on matters pertaining to the criticism of Wundt.

At the 1978 second annual meeting of the China Psychology Society, 29 papers were presented in criticism of Wundt. These amounted to more than half the papers of the sub-unit for basic theoretical research in psychology. At the conference, 10 papers from Comrades Chen Li [7115 4539], Gao Juefu [7559 6030 2421] and others were read aloud. Everyone's thoughts were liberated; they spoke freely; and launched discussions.

Numerous different views about the psychology of Wilhelm Wundt exist at the present time among psychologists in our country, the principal of which are presented below in four sections.

Just what was the philosophical foundation for the psychology of Wilhelm Wundt? Comrade Jing Qicheng [5427 0366 6134] long ago pointed out in his book, "The Theoretical Foundations of Wundt's and Tieqinna's [phonetic 6993 2953 4780] School of Psychology," that the fundamental viewpoint of Wundt's psychology was the viewpoint of Machism. In their papers, some comrades especially analyzed the psychology of Wundt as a concrete manifestation of, as having its class origins in, and as having its ideological origins principally in the philosophical foundation of Machism. However, there were different views about the philosophical foundations of Wundt's psychology. Some said it was Neo-Kantism; some said it was objective idealism; some said it was dualism; and some said that it was monism combined to some extent with materialism, and that it seemed to contain some spontaneous dialectic elements.

Just what was Wundt's psychology constructed from? The majority of comrades felt that Wundt's psychology system was chaotic, contradictory, and characterized by compromise-ism. But, as soon as the specific content of Wundt's system of psychology was broached, there was no complete identity of views. Some said it was a theory fashioned from the object and the methods of psychology, an analysis of the elements of consciousness, psychological processes and the theory of the equality of body and mind. Some others said it was compounded from the theory of the equality of body and mind, the object of study of individual psychology (direct experience), the research methods of individual psychology (the introspective method of experimentation), the chief problem in individual psychology (analysis of the elements of the consciousness and studying their laws of combination).

Just how can the introspective method of Wundt's psychology be comprehended? Some said that the "ego examination" and "inner consciousness" of Wundt was a synonym for introspection, or that the methodology of introspection is deduced from materialist empiricism. Some said that Wundt's introspective methods stemmed from the same origins in an idealistic viewpoint as his "direct and underived" direct experience. Some said that Wundt's introspective methods were founded in philosophy; that they were doctrinal



manifestations of the immanentism of Machism. This fully demonstrated the unity of Wundt's subjectively idealistic world view and methodology, and also clearly reflected the antagonism of methodology between Wundt's idealist psychology and materialist psychology. However, people also held the exact opposite view, maintaining that Wundt's introspective methods did not derive from philosophy but from physics and physiology. Still others supposed that there was no need to equate introspection with idealism, and that Wundt's classic introspection possessed positive significance. It was helpful in studying the subjective imagery of psychology, in promoting the development of methods of studying psychology, in giving impetus to the development of psychological research work, and in training a group of experimental psychologists. Of course, Wundt's classic introspection also had its limitations. This was reflected not only in the research problems of object and its application that had been taken in hand, but was manifested as well in its natural inability to analyze sufficiently to explain the laws and principles of the subjective images.

Just what was the effect on the future of Wundt's psychology? Some said Wundt need not be ashamed of being an innovator of modern psychology who had pioneered a new era in the history of psychology, and who had made epoch-making contributions. His principal contributions were as follows: He opened a "new territory in science," making psychology into an independent science; he set up the first psychological laboratory in the world, launched a large amount of experimental psychological research, and established a system of experimental psychology; he trained a corps of psychological specialists, and founded an international school of psychology. Some said that Wundt's system of psychology possessed positive elements in itself. Examples included regarding the psychology as a process of thought (rather than as a substance); use of the methods of analysis and synthesis in the study of ideas in psychological phenomena, division of the psychological process into sensory perception and emotion; "creative synthesis," "balance," and "development toward antithesis," and such ideas for the development of laws. Some said that Wundt's psychology carried some negative influences for traditional psychology in the future. Examples were Wundt's proceeding from his theory of the equality of body and mind to regard as completely different in essence the mind and the body, the mental and the material, that thus stand as things that cannot be compared and making it difficult for future psychologists to remove these constraints; Wundt's proceeding from his theory of the equality of body and mind to make the psychology into an independent process, which very naturally might cause the study of psychology to be construed as only the study of the mind, with the result that later on some psychologists left the totality of psychological activity for the methodology of introspective analysis.

During the past 30 years, psychologists in our country have explored the above stated problems and have studied some basic theoretical problems as well, such as the problem of the essential nature of the psychology and its class nature; the problem of laws of psychology common to all mankind; the problem of the evolution of the psychology of animals and human consciousness;

the problem of the relationship between imagery and abstract thinking; and questions about the current state and theories of psychology abroad. Lack of space prohibits further details.

### Experience and Outlook

What has been the principal experience in basic theoretical research in psychology in China during the past 30 years? First, that basic theoretical research work in psychology must be given more attention and be strengthened.

This is a prerequisite for actively launching basic theoretical research in psychology. The experience of history has demonstrated that the effects of empiricism on modern psychology, and principally the effects of positivism have been rather severe. This has led not only to slight regard for basic theoretical research in psychology, but has made hazardous the further development of foreign psychology. Though psychology circles in our country launched some basic theoretical research work 30 years ago, it has still not gained the universal regard it deserves. Some comrades frequently feel that to undertake basic theory is to "talk rubbish," "to blow hard," or "to sit and talk but never solve problems." This is clearly incorrect. We must clearly and positively launch basic theoretical research in psychology. This is directly related to the whole future development of psychology in China and is of strategic importance. If we do not give sufficient attention to or enhance basic theoretical research, it will be very difficult for our country's psychology to move ahead, very difficult to make any innovations, and very difficult to satisfy the pressing needs of the four modernizations.

Second, there must be adherence to the guidance of Marxism-Leninism and Mao Zedong Thought.

This is the theoretical foundation for the smooth development of basic theoretical research in psychology. We know that the study of psychology already has a fairly long history, but that it has remained in a not fully mature stage of development. And the main reason for this has been lack of proper theory to act as a guide. If psychology is to be a science, it must be built solidly upon the theoretical foundation of Marxism-Leninism, and it must completely accept the guidance of dialectic materialism and of historical materialism. The experiences of history tell us that whether we adhere to the guidance provided by Marxism-Leninism and Mao Zedong Thought ramifies into the question of whether we can truly build a scientific psychology system in China. This guidance is not, however, the substitution of philosophy for psychology, nor does it mean that each takes what he needs to write cliches that lack originality, but rather it means the complete and proper implementation of the guidance provided by the system of thought of Marxism-Leninism and the Thought of Mao Zedong. In other words, we must master the standpoint, the viewpoint, and the methods of Marxism, persevere in practice being the sole standard for testing truth, apply the law of the unity of opposites of materialist dialectics in analyzing and resolving all kinds of psychological problems and in studying and absorbing all the accomplishments of the study of psychology, ancient and modern, Chinese and foreign.

Third, it is necessary to persevere in the principle of linking theory and practice in order to make basic theoretical research proceed more closely with the modernization of practical psychological learning and serve our country's four modernizations.

This is the basic goal in our country's launching of basic theoretical research in psychology. The study of psychology is a basic science with a very strong theoretical component. The first task of the study of psychology is to reveal in specific ways the nature of consciousness, how it arises, and how it develops. This belongs to the category of basic theory. However, it is by no means totally unrelated to reality, because the basic theories of psychology always derive from the various practical activities of man and are of service in the various practical activities of man. Consequently, one cannot study the human psychology apart from man's practical activities. Since this is so, psychology is a basic science that possesses both important theoretical significance and broad practical significance. Therefore, proper implementation of the principle of linking theory and practice is particularly important for psychological research. The experiences of history show that whether one can properly adhere to the principle of linking theory and practice not only has ramifications for the question of the basic direction of psychological research, but also has ramifications for the question of the flourishing and blossoming of psychology.

Fourth, there must be adherence to the liberation of thought, the exercise of academic freedom, and diligent implementation of the policy of "let a hundred flowers bloom; let a hundred schools of thought contend."

This is a prerequisite condition for the launching of basic theoretical research in psychology. We know that psychology is a science that is at once old and young. The existence of psychology in the world as an independent science is only a matter of 100 years, and in China it has a history of only several decades. Moreover, the objects of the study of psychology are so complex that not only is a theoretical knowledge of philosophy and the social sciences necessary, but a proper level of the broad knowledge of the natural sciences is also required. Therefore, to really set up a psychology that suits the needs of socialist modernized construction and that possesses our own country's theoretical systems requires adherence to the liberation of thought, the exercise of academic freedom and conscientious implementation of the policy of letting a hundred flowers blossom and a hundred schools of thought contend. The experiences of history during the past 30 years shows that psychological circles frequently jumble together academic questions and political questions in conversation, and those who hold different views are sometimes "criticized" as class enemies or are "encircled and suppressed," or even "dismissed from office." The result is that some of our talented scholars in psychology have been destroyed, the full exercise of talents by the broad masses of psychologists adversely affected, and the development of China's psychology impeded. The seriousness of these effects were still manifest more than 2 years after the smashing of the "gang of four," and they have made rigid or semi-rigid the

thinking of some comrades in the world of psychology who now lack a spirit of independent thinking, who now lack the courage for theoretical research, and who still do not dare state their views unequivocally. For this reason, it is very important in the field of psychology to advocate the liberation of thoughts, the exercise of academic freedom, and the implementation of a policy of "let a hundred flowers bloom and a hundred schools of thought contend." If the psychologists in our country are truly to liberate their thoughts, use their brains, dare to think and dare to speak, it will not do to have no freedom, because freedom is both a prerequisite and an assurance in the liberation of thoughts. Moreover, the greatest freedom in the academic world is true implementation of the policy of "let a hundred flowers bloom and a hundred schools of thought contend," rather than "one school" contending independently. For this purpose, we must resolutely oppose the capricious mixing of academic questions with political questions, and it is even more important not to permit academic contention to be handled as a struggle between the enemy and ourselves. On questions of right and wrong in academic theory, a cautious attitude must be maintained. No one can monopolize truth. In the face of truth, everyone is equal and mutual discussion is to be advocated, a hundred schools of thought contending be encouraged, with no coming to conclusions lightly, nor adoption of administrative tactics to solve problems. If only these things are done, some of the "forbidden zones" in basic theoretical research in psychology such as the question of the class nature of psychological phenomena, questions about critiques of Soviet psychology and European and American psychology, questions of the biological inheritance of the psychology, questions of intelligence and its measurement, and questions about factor separation and quantity handling, will naturally be pursued, in the spirit of a quest for truth; red tape will be discarded; and forbidden zones destroyed, as everybody makes a contribution to the development of our country's study of psychology.

Fifth, it is necessary to adhere to the principles of retaining the ancient for use by the modern, and of the foreign for use by China with a good combination of criticism and continuity.

This is an important aspect in launching basic theoretical research in psychology. Lenin pointed out that, "Proletarian culture did not just drop out of the sky, nor was it made up by some self-appointed experts in proletarian culture. To suppose that it was is utter nonsense. The culture of the proletariat has to be a total body of knowledge that develops in accordance with laws and was created by mankind under the oppression of bourgeois societies, landlord societies and bureaucratic societies." This tells us that psychology was also not created out of thin air but was the inevitable product of the development of culture and science over the past several thousand years, and particularly during the most recent hundred years. Consequently, in the handling of the question of the inheritance in the study of psychology from ancient and modern times or from China and the outside world, one positively cannot adopt a metaphysical negation view, but must adhere to a negation view of the materialist dialectic method. In using the doctrine that everything has only one aspect to handle the historical



inheritance of psychology, the former makes no total affirmation but a total negation; in using the doctrine that everything has two aspects, the latter nurtures the healthy and discards what is not; it destroys and it creates; it organically combines learning, criticism, and continuity. The experiences of the past 30 years of history show that we have some people who sometimes treat foreign psychology with an attitude that is frequently like a transplantation of political relationships between states; they lack the scientific attitude of seeking truth through facts and steadfastness on theory. For a long time there has been a bias against psychology from the Soviet Union and from Great Britain and the United States. This shows mostly that frequently the emphasis is on criticism without sufficient affirmation of things of value that might be adopted for use. We should not lightly label foreign psychology as "bourgeois," or "revisionist." We should be adept at continuing all of the fine inheritance in the history of psychology, absorbing every advanced technique and research results of value from modern foreign psychology, using them as nutriment for the rapid growth and strengthening of the dialectic materialist psychology that we want to build. However, to continue is not simply to take. There must be a diligent analysis and criticism with processing and reform, because modern psychology from many places has been deeply branded with bourgeois ideology. Therefore, it is actually necessary to criticize the idealistic imputities and the reactionary content of bourgeois psychology. The problem lies in having one divide into two and in convincing people through reason. Only by dialectically uniting criticism with continuity can the old be truly smashed and the new truly built and the goal of using the ancient for use by the modern and the foreign for the use of China be realized.

As our country enters a new era of great historical change, not only should we look back to absorb the lessons of experience, but more important is to cast our eyes to the future and do our best to get ahead quickly in promoting basic theoretical research in psychology.

It is extremely evident that in the process of development of the four modernizations and future science in our country, the prospect for psychology seems splendid and the outlook great. So what is the mission of basic theoretical research in psychology in China? We believe that at the present time the most important mission of basic theoretical research in China is: under the guidance of Marxism-Leninism and Mao Zedong Thought, and in consideration of the real needs for both the modernization of the field of psychology and the four modernizations of our country, to research in depth the basic laws and principles pertaining to the innate character, specific properties and inherent action of the object of psychological studies, and to study the principles commonly shared by all sectors of psychology. Examples are theories about the object, mission, nature and methods of the study of psychology, theories about the relationship between psychology and philosophy, theories about the relationship among psychology, physiology, and other natural sciences, theories about the essential nature of the psychology, theories about the source and development of the consciousness, theories about psychological processes, theories on personality,

theories about the history of psychology, some new theories on psychology from abroad, etc. Surely a study of these problems will take a long time; it is not something that can be completely solved at once. However, we believe that under the leadership of the Central Committee of the Party headed by Comrade Hua Guofeng, and by adhering to the guidance of Marxism-Leninism and Mao Zedong Thought, our psychologists in combining theory with practice in launching deeply into psychological research must gradually achieve greater and greater results. Doubtlessly, it will not only hasten the building of a system of scientific psychology in our country, but will also impel psychology to make the contribution it should make in the early realization of the four modernizations.

#### BIBLIOGRAPHY

[Not included with this translation]

9432

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IDENTIFICATION OF STEROIDS, HOPANE IN OILSHALE

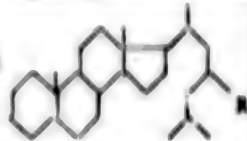
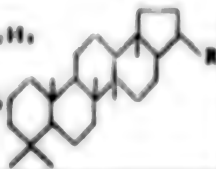
Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 3, Sep 79 pp 256-260

[Article by Jiang Shanchun [1203 0810 2504], Xu Penfang [1776 5358 5364], Fan Shanfa [5400 0810 4099], Ge Zhichang [5514 3112 1603] of the Institute of Geochemistry, Chinese Academy of Sciences; Hou Luning [0186 2464 1380], Ji Yunlong [1323 0061 7893], Ruan Jinfan [7086 6930 5400] of the Research Institute of Shanghai Petrochemical Main Plant; Wu Yuanwei [0702 0337 0251], Fu Guixiang [0265 2710 7449], Xu Yongzhen [1776 3057 3791] of the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences: "Capillary GLC-MS Identification of Steroids and Hopane in the Oil Shales from an Oil Field in North China"]

[Text] Last year, with the use of ZhD-01 type chromatography-mass spectrometer and MAT-112 type chromatography-mass spectrometer-computer, which were manufactured in our country, we managed to identify the following steroids and hopane components in oilshale samples gathered from the Tertiary Shahe Boundary Group of an oilfield in north China: 5 $\alpha$ -cholestane, 5 $\beta$ -ergostane, 4-methyl ergostane, 5 $\alpha$ -ergostane, 5 $\beta$ -stigmastane, 5 $\alpha$ -stigmastane, 4-methyl stigmastane, hopane and the recently identified 4-methyl-5 $\beta$ -stigmastane. For methods of identification, please refer to Reference Documents (1-3). The oilshale samplings were crushed and subjected to 80-mesh screening, extraction with chloroform solvents in Soxhlet's apparatus, column chromatography with silica gel-aluminum oxide (normal hexane was used as the eluant), which produced paraffin hydrocarbon components. Urea-methyl alcohol saturated liquid complex was added to remove the normal paraffin hydrocarbons, and the noncomplex solution contained such compounds as isoprenoid hydrocarbons, steroids, hopane, etc. The solution was subjected to hydrolysis, extraction with ether, and put to instrument analysis following the enrichment process.

An Sp 2305 gas chromatograph was used to test the separation conditions of the samples first before separating the samples with stainless steel capillary columns (length 40 m; inside diameter 0.4mm; stationary liquid was Apiezon L10 percent); a hydrogen flame ionization detector was employed in the tests which produced chromatographic peaks. Subsequently, the

Table.

1. 化合物名称	2. 分子式与结构式	3. 质谱特征		
		(a) 分子峰	(b) 基峰	(c) 主要碎片峰
(1) 5 $\alpha$ -胆甾烷	$C_{27}H_{48}$ R = H 	372	217	157, 149, 151
(2) 5 $\beta$ -麦角甾烷	$C_{27}H_{48}$ R = CH <sub>3</sub>	386	217	171, 149, 151
(3) 4-甲基麦角甾烷	$C_{28}H_{50}$ R = CH <sub>3</sub>	400	231	242, 246, 276, 161
(4) 5 $\alpha$ -麦角甾烷	$C_{27}H_{48}$ R = CH <sub>3</sub>	386	217	171, 149, 151
(5) 5 $\beta$ -豆甾烷	$C_{28}H_{50}$ R = C <sub>2</sub> H <sub>5</sub>	400	217	385, 149, 151
(6) 5 $\alpha$ -豆甾烷	$C_{28}H_{50}$ R = C <sub>2</sub> H <sub>5</sub>	400	217	385, 149, 151
(7) 4-甲基5 $\alpha$ -豆甾烷	$C_{29}H_{52}$ R = C <sub>2</sub> H <sub>5</sub>	414	231	399, 149, 151
(8) 4-甲基5 $\beta$ -豆甾烷	$C_{29}H_{52}$ R = C <sub>2</sub> H <sub>5</sub>	414	231	399, 149, 151
(9) 藿烷	$C_{30}H_{52}$ R = C <sub>2</sub> H <sub>5</sub> 	412	191	397, 369

Key:

## 1. Compound Name

- |                            |                                      |
|----------------------------|--------------------------------------|
| (1) 5 $\alpha$ -cholestane | (6) 5 $\alpha$ -stigmastane          |
| (2) 5 $\beta$ -ergostane   | (7) 4-methyl-5 $\alpha$ -stigmastane |
| (3) 4-methyl ergostane     | (8) 4-methyl-5 $\beta$ -stigmastane  |
| (4) 5 $\alpha$ -ergostane  | (9) hopane                           |
| (5) 5 $\beta$ -stigmastane |                                      |

## 2. Molecular Formula and Structural Formula

## 3. Mass Spectrometric Characteristics

- (a) Molecular Peak  
(b) Base Peak  
(c) Major Fragment Peak

chromatographic peaks of samples which had been separated by the gas chromatograph were input into the boundary device of a chromatography-mass spectrometer, i.e. a porous glass molecular separator. Large quantities of carrier gas were removed; the pressure at the sample inlet of the mass spectrometer's ionization source was reduced; the input samples were ionized by the mass spectrometer ionization source, and the ion beams



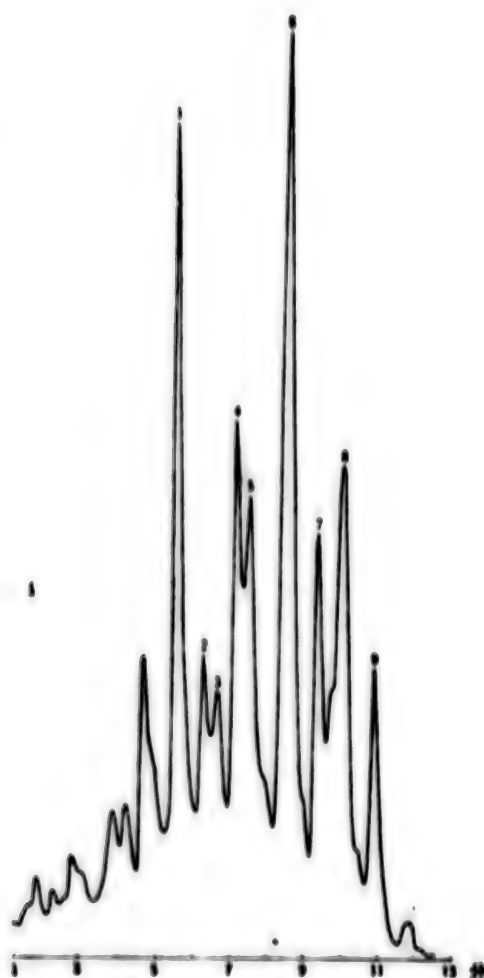


Figure 1. Chromatographic peaks of steroids and hopane components in oil shale

- Key:
1.  $5\alpha$ -cholestane
  2.  $5\beta$ -ergostane
  3. 4-methyl ergostane
  4.  $5\alpha$ -ergostane
  5.  $5\beta$ -stigmastane
  6.  $5\alpha$ -stigmastane
  7. 4-methyl- $5\alpha$  stigmastane
  8. 4-methyl- $5\beta$  stigmastane
  9. hopane
  10. carrier gas: He, 130°C., temperature rose to 270°C, chromatographic peak at stabilized temperature.

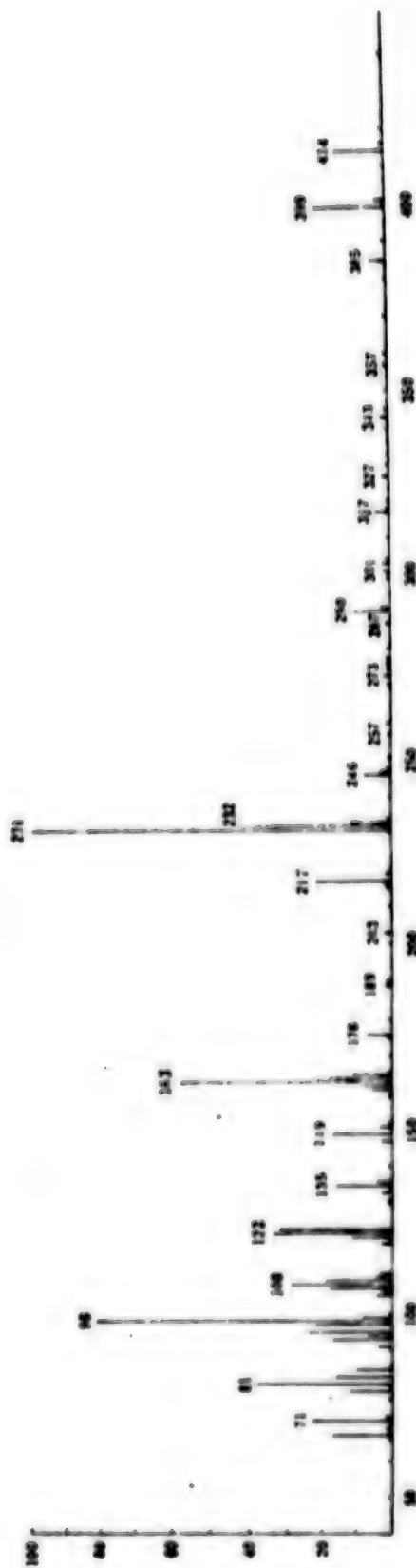


Figure 2. 4-methyl-5 $\alpha$ -stigmastane mass spectrogram  
(ordinate is relative humidity; abscissa is m/e;  
figures 3 and 4 are the same)

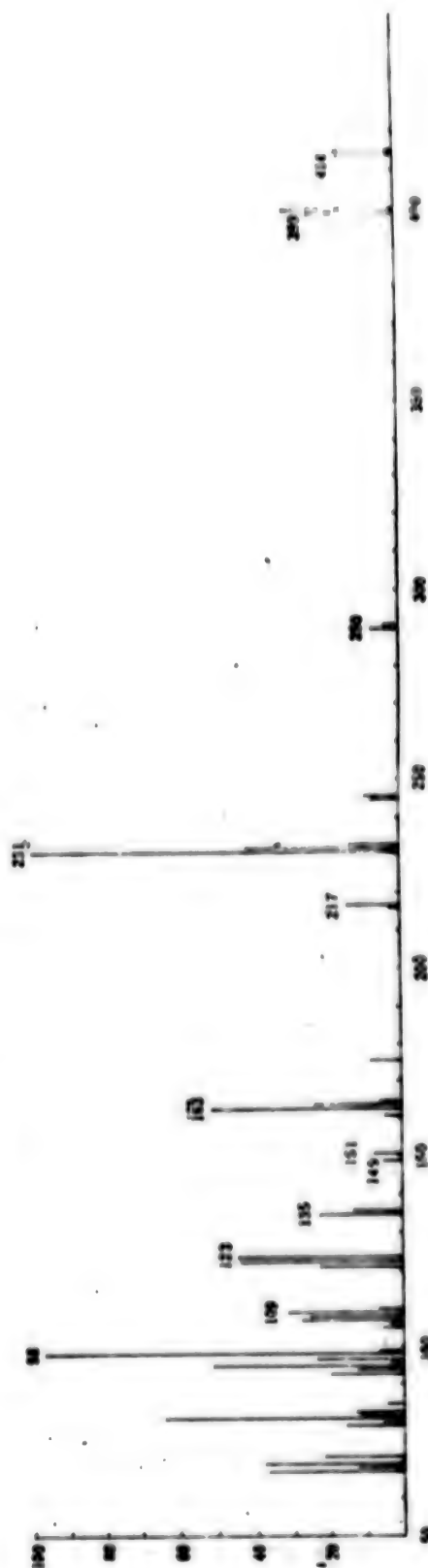


Figure 3. 4-methyl-5 $\beta$ -stigmastane mass spectrogram

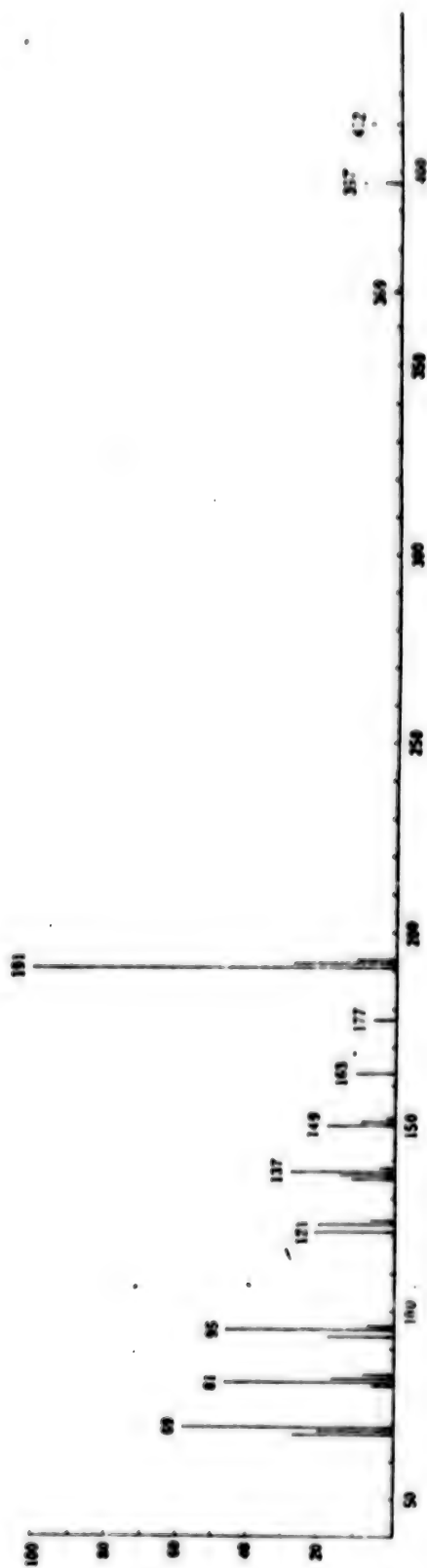


Figure 4. Hopane mass spectrum

were recorded, thus producing the total ion current peaks from the mass spectrographic analysis which were similar to chromatographic peaks. The ions were separated as they entered the mass spectrometer's magnetic field, thus obtaining partial ion currents which were amplified and recorded as mass spectrograms for analysis. The results of the qualitative determination of the mass spectrograms are denoted on each chromatographic peak in the caption Figure 1. The instrument operation conditions were as follows: ZhD-91--ion voltage 20 eV and 70 eV chromatographic-mass spectrometric analysis switching; emission current 400  $\mu$ A. MAT-112 (Research Institute of Shanghai Petrochemical Main Plant)--variable narrow slot type chromatographic-mass spectrographic boundary, computer interface 10 V, 12 KHz. Figures 2-4 show the mass spectrograms of steroids and hopane from chromatographic-mass spectrometric analyses; the mass spectrometric characteristics are listed in the preceding table.

The results of identification indicate that there is a high content and great variety of steroids in the Tertiary oil source rocks of the oilfield in north China, and the kerogenes could very well be higher plant debris.

The authors would like to express their appreciation for the samples provided by comrades Zhou Zhongyi [0719 0022 3015] and Jia Rongfen [6328 5554 5358].

#### REFERENCES

1. Wardroper, A.M.K. et al.: 1977, Analysis of steranes and triterpanes in geolipid extracts by automatic classification of mass spectra. GEOCHIM. et. COSMOCHIM. ACTA, Vol 41, No 4.
2. Kimble, B.J. et al.: 1974. Identification of steranes and triterpanes in geolipid extracts by high resolution gas chromatography and mass spectrometry. CHEM. GEOL., Vol 14, No 3.
3. Kimble, B.J. et al.: 1974, Tri and tetra-terpenoid hydrocarbons in the messel oil shale. GEOCHIM. ET COSMOCHIM. ACTA, Vol 38, No 7.

9119

CSO: 4008



## PHYSICAL SCIENCES

### ZIGONG CITY SALT, INDUSTRIAL PRODUCTION REPORTED

Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 6, Jun 79 pp 7-9

[Article by He Qing [0149 7230], Zhenlin [2182 2651], and Qizi [0796 0056]:  
"Zigong City"]

[Text] Zigong, famous for its production of well salt, is known as "the salt capital." It is situated in the south-central part of the Sichuan Basin. The city is in a medium and shallow hilly region. The hills within the city limits rise to an average of 350 meters above sea level. The entire city spans 38 kilometers from south to north and 33 kilometers from east to west. The Youfuxi River flows from the northwest towards the southeast through the city and into the Changjiang by way of Tuojiang. The river is a waterway for the transportation of salt. The Chengdu-Chongqing Railway has a Nei Jiang-Yibing branch that passes through Zigong. Transportation is convenient. The eastern portion of Zigong originally belonged to Fushun County, and the western portion originally belonged to Rongxian County. Both are places that produce plenty of well salt. In the history of salt production in Sichuan Province, the Fu Rong salt fields are known as the east and west fields. County records state that the brine of the salt wells of the east field gushes out by itself, therefore it is called the "self flowing well." The well salt produced in the west field was presented to the emperor and it was said that in the past paying taxes on salt was called paying tribute to the imperial court. Therefore people called the place "the wells that pay tribute to the imperial court." Although the history of salt production here is very long, because the market for the salt was only established a short time ago, it was only until 1939 that the salt producing regions of Fushun and Rongxian were zoned and the areas of the "self flowing wells" and "the wells that pay tribute to the imperial court" were designated together as Zigong. This is the origin of the name "Zigong." "Since liberation, Zigong has always been a city under the direct control of the provincial government of Sichuan. Now the entire city includes four wards and one county, the Ziliujing Ward, the Daan Ward, the Gongjin Ward, the Suburban Ward and Rongxian with a total population of 1.5 million.

## Rich Salt Industry Resources

Geological survey data show that the reserves of halite, brine and natural gas in the Zigong region are rich. Halite is distributed in the Triassic layer at Dashanpu, Dawenbao (Daan Ward), Guojiaao and Tudipo (Ziliujing Ward). In 1968, a rich deposit of large strata of halite mines west of Weiyuan and Rongxian were discovered (the stratum of the mines averaged 26 meters in thickness and the thickest reached 40 meters). The mines extend into the neighboring counties of Jingyan and Jianwei. The quality of the halite is good and it is not buried too deeply. It is estimated that the reserves can be mined for over 2,000 years. The discovery of the Weixi salt mines has provided a sufficient source of raw material for the great leap forward in the production of the salt and chemical industries. The reason for the formation of such a rich storage of halite in the Zigong region must involve a discussion of a wider scope of its geological structure.

The Sichuan Basin is a region of relatively stable crustal activity in the geological structure. From the Upper Sinian Period to the Permian Period, the rise and fall of the crust caused the region to be flooded by sea water several times. During the Triassic Period of the Mesozoic, the region was again flooded by sea water. In this geological period, the central part of the region was depressed and sea water was separated and isolated into half enclosed or completely enclosed lagoons. In addition, the ancient weather conditions were hot and dry, the amount of evaporation was greater than the amount supplemented, thus several layers of halite and gypsum were formed. After these became ores they were again covered by sediments. They were sealed well and were not corroded. Brine of Zigong can be divided into two kinds, yellow brine and black brine. Yellow brine contains more ferric oxide mud and sand and therefore it is yellow. It is found about 200 to 700 meters below the surface of the earth with a salt content of 12 percent. Black brine contains hydrogen sulphide and more organic matter, thus it is black and is found about 900 to 1,300 meters below the earth's surface. Its salt content is 17 percent and it also contains such elements as strontium and lithium. They are found in the reciprocal layers of sandy shale of the Triassic Period and the Jurassic Period of the anticlines of Ziliujing, Xinglongchang and Dengguan. Brine can be easily stored in sandstone and shale prevents the brine from leakage and loss. At present, wells are sunk for the extraction of brine in the fault zone on anticlines. The natural gas resources of the Zigong region are also very rich. Natural gas is hydrocarbons converted from the remains of such simple plants and animals as algae under concealed conditions of high temperatures and high pressure. Its distribution is even wider than brine and is concentrated in the southwest regions of Sichuan centered around Zigong. Topographically the region is generally consistent with the dome and shallow hilly regions, and at present, it is our nation's largest natural gas region. The major strata containing natural gas are the Xiangxi system of the Jurassic, the Jialinjiang form of the Triassic, the Yangxing system of the Permian and the strata of Sinian. Analysis of data gathered from well sinking and archaeological conditions shows that the deeper the strata the richer the store of natural gas. For

example, recently, a deep and vertical well was sunk by the Tuanjie Commune of Zigong and a rich reserve of natural gas was obtained. Natural gas is mainly stored in the cracks among carbonate rocks and sealed up by mudstone, gypsum and halite.

There are at present 13 natural gas fields that are being prospected in a concentrated effort, such as the Ziliujing natural gas field, Dengguan natural gas field and the Xinglongchang natural gas field. Anticlinal strata are selected mainly for sinking of wells, especially above the bends and faults. The yield of natural gas has increased year after year and in 1977, it was 270 times that of the beginning period after liberation. In the future, tapping of natural gas will be directed towards the deeper strata of the Cambrian and Sinian Periods. It is definite that as the need for natural gas by the salt industry, chemical industry and other departments of Zigong become massive, the exploitation of natural gas will experience an even greater jump forward.

#### Long History of Salt Extraction

The extraction of brine to produce salt in the Zigong region began in the Eastern Han Dynasty. It has a history of over 1,700 years. During the Han Dynasty, there was the famous Fushi salt well near Chengguanzhen in present-day Fushun County. During the reign of Emperor Wu of the Northern Zhou Dynasty (560-578 A.D.) the county of Fuyi was established at the site of the Fushi salt well. The regime of the Northern Sung Dynasty named it Fushun County (the present day Fushun County). During the Jin Dynasty, there was the famous Dagong well in the Gongjing region of present day Zigong city. During the reign of Emperor Wu of the Northern Zhou, a town called the Gongjing Township was established here. During the first years of the Tang Dynasty, Gongjing Township was renamed Gongjing County which is the present-day Gongjing Ward of Zigong City (formerly Gongjing ward of Rongxian County). At the end of the Ming Dynasty and the beginning of the Manchu Dynasty, the salt producing area of Fushun County developed along the Fuxi River towards the Ziliujing Ward of present-day Zigong City and joined with the salt producing region of Gongjing in Rongxian County, thus the area began to be called the Furong Salt Fields (the present-day Zigong salt fields). In 1939, the salt producing region of Fushun County known as Ziliujing and the salt producing region of Rongxian County known as Gongjing were separately zoned apart from the original administrative area and a separate city was established called Zigong City.

Historically, the production of well salt in Zigong has been classified into two kinds, brine wells and gas wells. Brine wells are further divided into three types: One is the halite well. At the bottom of the well is the halite mine. Water has to be injected into the mine from the ground surface to dissolve the rock salt to form brine. The brine is then extracted by suction for the production of salt. The brine is clear. Its contents of salt is high, its content of impurities is low and its yield of salt is high. The second is the yellow brine well. This type of well contains

yellowish brine because it contains mud and sand. The concentration of brine is lower and the yield of salt is relatively lower but it contains relatively more chemical and industrial raw materials such as bromine and iodine. The wells are a natural brine source and pumping of water by man is not needed. The third is the black brine well. The brine in this type of well contains hydrogen sulphide making the brine black. The concentration of brine is high and the yield of salt is high. It also contains especially rich chemical and industrial raw materials. It is a larger source of natural brine than yellow brine, and frequently it is accompanied by natural gas. Therefore, black brine wells are the most ideal, containing both salt and chemical raw materials. The gas wells of Zigong can also be divided into two kinds: One kind is water gas wells commonly called water gas wells. This type of well contains brine and natural gas. Both brine and gas fires exist. The brine of this type of well is mostly black brine but some wells contain yellow brine. The second is pure gas wells commonly called dry gas wells. This type of well produces only natural gas. There is no water.

Although the production of well salt of Zigong began in the Eastern Han Dynasty, greater development did not occur until the Tang Dynasty. At that time the Fuyi salt wells were sunk to the Jurassic stratum and rich yellow brine was recovered. A record of a monthly production of 183,000 jin of salt was created. At the time, there were some 30 famous salt wells like the Fuyi well and the Dagong well in the region of present-day Fushun County, Rongxian County and Weiyuan County with Zigong as the center.

Between the years of Qingli and Huangyou of the Northern Sung Dynasty (1041 to 1053 A.D.), a technical breakthrough in the production of well salt in the Zigong region occurred. The world famous method of sinking small holed but deep wells was invented--the straight tube wells, which replaced the ancient large mouthed shallow wells. This invention preceded similar types of deep wells of foreign nations by over 1,000 years. Due to the renovation in the art of well drilling, salt production of the Zigong region rapidly developed. Zigong shared the same glory as the Shehong, Pengxi, Jianwei and Dongshan salt fields of the same period to become one of the three largest salt fields in the entire province of Sichuan.

The period between the years of Qianlong and Tongzhi during the Manchu Dynasty (the beginning of the 18th century to the latter period of the 19th century) was the peak period of production of well salt of the Zigong region in its history. At the time the annual production of salt reached 200,000 to 300,000 tons, surpassing the production of Shehong and Pengxi salt fields, and Zigong became famous as the "salt capital." At the time, capitalism of the salt fields of the Zigong region further developed. Large groups of financially broke farmers went into the salt fields to become contract workers. Strict and systematic division of labor was exercised in the salt fields and the backward technique of establishing mills was improved and this objectively benefited the development of production. At the same time, a series of array of tools for drilling, fishing (not to catch fish but to retrieve something, a term used in drilling technology), and well control



emerged and the technology of well drilling became more complete day by day. Upon the basis of technological renovation, the salt wells were sunk to 260 and 270 meters reaching the limestone of the Triassic. Black brine like black gold gushed upwards. At the same time many high yielding natural gas wells were opened. These created conditions for the universal use of natural gas to cook the salt in the salt fields. The change in the productive relationship and the elevation of production technology created a rapid development in salt production in the Zigong region. The amount of salt produced rose rapidly and the cost dropped drastically. This strengthened the competitiveness in the market of well salt produced by the Zigong region. Later, the great Taiping Revolutionary army attacked and took over Wuchang and occupied Nanjing. Fighting was heavy in the lower reaches of the Changjiang and the waterways were blocked. The supply of traditional edible salt--Huai salt--of Hubei and Hunan ceased. This gave Sichuan salt a chance to be sold en masse to Hubei and Hunan. During the short period after the third year of Xianfeng (1854), in the Ziliujing region alone, over 100 new salt wells were sunk. This shows that "aiding Hubei and Hunan with Sichuan salt" greatly stimulated the production of well salt of the Zigong region.

After the Revolution of 1911, reactionary warlords fought in the Zigong region repeatedly over control of the Zigong salt taxes from the "rich acres of the entire Sichuan Province." In addition, the unbridled plunder of imperialist nations of Russia, Japan, England, France and Germany and the excessive taxes and levies extorted by the reactionary faction of the Nationalist Party were devastating blows to the production of well salt of the Zigong region, and the yield dropped drastically. On the eve of liberation, the salt production industry of Zigong was barely alive and the annual yield was only 120,000 tons.

#### The Salt Capital Shows a New Face

At the end of 1949, Deng's great army liberated the entire province of Sichuan with one strike and the salt fields of Zigong were returned to the hands of the people for the first time. Under the correct leadership of the Chinese Communist Party, the people of the salt capital rapidly revived and developed salt production. In 1953, the yield of well salt surpassed the highest level of the past. In 1956, reformation of privately operated salt fields under the socialist ownership system was completed. At the same time, new salt fields were developed according to plan and outdated production equipment was renovated so that salt production continued to climb. In 1958, the new famous Zhengguan Salt Plant was built, and the original Gongjing Salt Plant, Ziliujing Salt Plant and Daan Salt Plant were renovated and their potential exploited so that these ancient plants having a history of over 1,000 years could continue to increase production. In 1962, the production of well salt from Zigong was over three times that of 1953. For the past decade and more, each salt plant has exerted great efforts to improve the technology of extracting brine and producing salt, and advanced vacuum salt processing shops were built. In 1973, the project of transporting brine from the great Weixi salt mine to Zigong City was completed. The



project can transport brine of an equivalent of 400,000 tons of unprocessed salt annually to Zigong City, improving the supply of brine to each salt producing plant to a larger extent. However, due to interference and sabotage by the "gang of four," the annual production of well salt during the recent decade and more declined. After crushing the "gang of four," the situation was fundamentally turned around. In 1978, annual production of salt surpassed the highest level of the past and surpassed that of 1974 by over 350,000 tons. The well salt produced in Zigong City contains less impurities and is a superior edible salt. Historically, this salt was supplied as edible salt to the people of most of the regions in Sichuan, Yunnan and Guizhou were the major markets for this salt, and the salt has been supplied to Hunan and Hubei for a long time. Today, the salt fields have a new appearance. In well sinking techniques, drills have been used in drilling. Steel tubes have replaced the bamboo tubes that lined the walls of the wells. The buckets used to draw water from the wells have been replaced by high pressure steam and high pressure water for drawing from the wells, and the use of flat pans for cooking salt has developed into the use of vacuum to produce salt. It can be believed that as the amount of edible salt consumed increases along with national construction, the production of well salt of the Zigong region will develop to an even greater extent.

Although the history of salt and natural gas production at Zigong is long, over this lengthy period, natural gas has only been used as fuel and brine has only been used to produce table salt. The residual solids and water were all treated as "waste dregs" and "waste liquids" and were dumped on mountain slopes and into the rivers. It was only until the period of the War of Resistance Against Japan when the Jiuda Company of Tianjin moved to Zigong's Zhangjiaba and built a plant that the residues were utilized. Manual operations were performed to extract small amounts of potassium chloride, boric acid, borax bromine, iodine. This developed until the eve of liberation when even production of this small amount of products of the chemical industry ceased. The birth of New China created the chemical industry in Zigong. During the first five-year plan, the Zhangjiaba Chemical Plant that engaged in mechanized production of boron, potassium, bromine and iodine was newly built beside the old plant site of the original Jiuda Company. Later, shops producing barium chloride, strontium carbonate, lithium carbonate, boric acid, potassium iodate, caustic soda, hydrochloric acid, phosphorous fertilizers were set up one after the other and the "waste dregs" and "waste liquids" from salt production were ceaselessly and comprehensively utilized. Waste became treasure and the harmful became beneficial things. Seventeen kinds of chemical and industrial products urgently needed by the motherland were extracted and produced from waste residues and waste liquids. The barium chloride produced had a higher quality than that produced in Britain. It was sold to over 40 nations of the world and enjoyed a good reputation in the international market.

In 1958, the Honghezhen Chemical Plant which was a modern plant for comprehensive utilization of natural gas and salt was newly built. It was our nation's first plant to use natural gas to produce solvents for film-dichloromethane. It filled the void in our nation. Premier Zhou cared

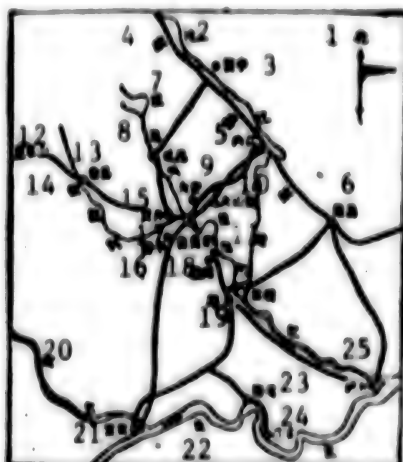
about this when he was alive and encouraged China to be self reliant and strive towards building a strong nation. The plant was also a joint productive enterprise designed by our nation. It combined automatically sealed circulation of liquid materials, automatic control and remote control operations in the production of ammonia and soda. It opened the path towards the inland development of soda and nitrogenous fertilizers industries. The pure soda and caustic soda produced by the plant in one year was equivalent to 50 and 80 percent of the highest annual production of old China. The chemical fertilizers produced annually by this plant was equivalent to 38.1 percent of the annual production of chemical fertilizers of old China. The main plant of the Honghe Chemical Complex produced 16 important and 16 important chemical and industrial products including dichloromethane, pure soda, caustic soda, ammonium chloride, and dicalcium phosphate. These were all very useful for developing our nation's film, steel and iron, paper manufacturing, glass, medical and pharmaceutical industries and agricultural production. Dicalcium phosphate was exported overseas.

Under the guidance of the Three Red Flags, the Zigong Carbon Black Plant on the banks of the Fuxi River was also completed. This plant used natural gas to produce large quantities of carbon black which is a necessary raw material for airplane and automobile tires. It is also necessary for paint manufacturing, printing, and dye industries. The Zigong Carbon Black Plant occupied an important position in the nation's production of carbon black.

Now Zigong City produces over 40 kinds of chemical and industrial products, some 30 more products compared to those before liberation. Annual production is over 2,000 times that compared to 1949, and the total production value of chemical and industrial products increased by over 2,200 times compared to 1950 and constitutes 29.33 percent of the total production value of the salt industry.

The development of the chemical industry from the salt industry also stimulated the development of the machinery industry. Before liberation, Zigong could not manufacture any kind of machinery. Besides some small smelters of iron-smiths, the entire city had only one small foundry for casting pig iron. After liberation, it was gradually expanded to become the Zigong Steel Casting Plant and First Machinery Plant. Iron workers of each well's salt cooking shop and machinery maintenance personnel were combined to form the Second Machinery Plant which was the salt manufacturing machinery maintenance plant. In 1958, a chemical machinery plant was built. Over the past 20 years, a group of machinery plants were set up. In particular, the construction of large enterprises such as the Changzheng Machine Tool Plant, Dongfeng Boiler Plant, Hongqi Transport Machinery Plant, High Pressure Valve Plant has enabled the machinery manufacturing industry to manufacture equipment for the salt industry and the petrochemical industry and major machinery needed by small chemical fertilizer production plants as well as such important products as boilers for large power stations, profiling mills, numerically controlled mills, large sulfur resistant valves, motorcycles, diesel engines,

mining machinery, hard alloys and carbon. During the Cultural Revolution, a group of agricultural machinery plants were also built. They provided all kinds of agricultural machinery and agricultural machine tools and agricultural water pumps. Today, the machinery industry's total value of production has jumped to where it constitutes 28.19 percent of the total value of industrial production of the entire city. As machinery for the chemical industry increased in production, new industries in electronics and building materials also developed. Light industry production also progressed. Today, Zigong City is no longer the "salt capital" of the past but it has already developed into a comprehensive city thriving mainly on salt production and chemical industry.



26. 自贡市地图

- |                     |                               |
|---------------------|-------------------------------|
| KEY: 1. North       | 2. Tuojiang                   |
| 3. Zizhong          | 4. Chengdu-Chongqing Railroad |
| 5. Neijiang         | 6. Longchang                  |
| 7. Weiyuan River    | 8. Weiyuan                    |
| 9. Daan             | 10. Dashanpu                  |
| 11. Fuxi River      | 12. To Leshan County          |
| 13. Rongxian County | 14. Rongxi River              |
| 15. Gongjing        | 16. Shuping                   |
| 17. Zigong City     | 18. Yantan                    |
| 19. Zhengguan       | 20. Minjiang River            |
| 21. Yibing          | 22. Changjiang                |
| 23. Nanxi           | 24. Jiangan                   |
| 25. Luzhou          | 26. Zigong City Location Map  |

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## APPLIED SCIENCES

### PROSPECTS FOR ENVIRONMENTAL GEOSCIENCE IN CHINA DISCUSSED

Beijing HUANGJING KEXUE [ENVIRONMENTAL SCIENCE] in Chinese No 5, 30 Oct 79  
pp 10-13, 63

[Article by Chen Jingsheng [7115 7234 3932] and Chen Chuankang [7115 0278 1660], Department of Geography, Beijing University: "Prospects for Development of Environmental Geoscience in China"]

#### [Text] 1. Environmental Problems and Environmental Geoscience

The earth's surface is the environment in which man lives. This environment has generally been called the geographical environment, and it is the object of research by several branches of geoscience. In its production and life activity, mankind inevitably affects the environment, producing changes in it, and the changing environment in turn affects mankind. When these effects have endangered mankind's normal production and life, environmental questions have arisen, and environmental science has arisen as the time required it. Environmental science does not study the total nature of the geographical environment, but only that part of its nature by which reactions of the environment to man's effects on it endanger human production and livelihood.

There have been different environmental questions in different stages of human development. In the Stone Age, because man engaged in large-scale hunting and burning of the wastelands, he drove many species to the verge of extinction, and destroyed many species with the potential for domestication or cultivation, thus affecting the progress of domestication and cultivation of species. The species which mankind later cultivated or domesticated in his higher levels of development are extremely limited in number. This is clearly associated with man's unthinking destruction of species resources.

The slave society created ancient culture, but this culture was very fragile. By irrigation of the wastelands, man created the culture of the two river valleys, but a war could put the irrigation works out of order and cause a new encroachment of the desert, or a plague could bring culture to the verge of destruction. Accordingly, this period's environmental questions involved how to maintain mankind's temporary victory over nature.

Feudal society was able to maintain a relatively stable agricultural society and some industrial and commercial cities. The main environmental questions in this period mainly involved erosion, flooding, wind and sand damage and soil salinification resulting from incorrect tilling, cutting of forests and the like. Large population centers could already produce pollution, leading to the formation of "fertilizer water" (fertilizer water means shallow underground water containing compounds of nitrogen, phosphorous and the like produced by pollution by living wastes), and could even be a reason for city inhabitants to select new sites and move to them.

With the rise of capitalism, and particularly with the development of modern industry, in addition to the persistence of the abovementioned harm to the environment, there also began to appear large-scale high-density population centers (cities, industrial and mining areas) and mechanized, chemicalized intensive agriculture, accompanied by disposal of the "three wastes," which led to large-scale environmental pollution. At this time, environmental effects were no longer limited to a generalized effect on mankind's production and livelihood, but went beyond the range to which human biology could adapt, harming health and leading to the appearance of pollution diseases. It was under these conditions that environmental problems led to a high degree of concern, and it was also under these conditions that a new composite scientific discipline, environmental science, grew up on the boundaries of many sciences.

In sum, different stages of social development have different environmental problems. At the same time, the problems of an earlier period can persist in a later period. Currently, the environmental problems of preservation of species resources (including variety resources), protection of nature (water and soil protection, forest protection), and environmental protection (prevention of pollution) actually exist at the same time. Moreover, the first two of these problems can be produced by the last.

Modern environmental science includes pollution surveys, environmental monitoring, pollution treatment, investigation of the laws of propagation and transformation of pollution, environmental quality evaluation and protection, investigation of the effects of pollution on ecology and human health, environmental zoning and planning, environmental economic research, environmental management and the like. Of these, the processes of environmental pollution, environmental quality surveys, evaluation and prediction, the behavior and ecological effects of pollutants in the environment, environmental zoning, planning and management and the like are the common research tasks of environmental science and geoscience, and thus are the subject matter of environmental geoscience. Environmental geoscience is a general term for a series of branch sciences, namely environmental geology, environmental geography, environmental geochemistry, pollutant meteorology, pollutant hydrology, pollutant pedology and the like. Their task is to investigate and get to the roots of the modern environmental problems associated with their respective subjects.

## 2. A Summary of the Development of Environmental Geoscience in Our Country

In the 1950's and 1960's of this century, modern environmental geoscience was developing rapidly in a number of industrially developed countries, and in the early 1970's our country turned its attention toward it. Because of the great importance attached to it by our country's party and government, particularly through Premier Zhou's personal concern and frequent directives, our country's environmental protection work and environmental research, including environmental geoscience research, underwent rapid development. Although the shortness of this period means that much work is still in the initial stage, excellent beginnings can already be seen in many areas. In the last 10 years, our country's environmental science has primarily pursued work in the areas discussed below.

### A. Regional Environmental Pollution surveys

Relatively large-scale work has already been undertaken in this area. Regarding the protection of water systems, work has focused on: investigation of the protection of the Guanting [1331 1689] water system and sources, pollution survey and control work in Yaerhu [7700 0348 3275] Lake, Hubei, pollution survey and control research in Baiyangdian [4101 3152 3244] Lake. In addition, there have been surveys of pollution conditions in individual sections of the Yangtze, Yellow and Pearl Rivers and of the Xiang [3276] River and the Tumen [0956 7024] River. The main work involving research on environmental quality in urban, industrial and mining areas includes: an environmental quality survey and comprehensive investigation of protective measures in the western suburbs of Peking, environmental quality evaluation in the urban area of Nanking, environmental quality survey and evaluation in the Maoming [5399 0682] area, environmental quality survey and evaluation in the Shenyang area. Surveys of environmental pollution are currently under way in the Wusong [0702 3247] and Jinshan [6855 1472] districts of Shanghai. In addition, certain cities have been carrying out work on a citywide scale and have done the corresponding environmental pollution surveys. As regards marine environmental quality research, work in progress includes: study of the sources and effects of oil pollution in the southern Yellow Sea, surveys of pollution in the Bohai, surveys of pollution conditions in Jiaozhou [5231 3166] Bay, Qingdao [7230 1497], and pollution surveys at the mouth of the Pearl River and in the South Sea. As regards agricultural environmental quality studies, studies of environmental quality have been conducted in the sewage irrigation areas of Peking, Shanghai, Shenyang, Xi'an, Chengdu, Shijiazhuang, Baoding, Zhengzhou, Maoming and Harbin, and surveys have been made of soil pollution by pesticides and the like in the main crop areas of our country.

Almost all of the above research began with a survey of pollution sources, and the types, quantities and disposal characteristics of the pollutants were determined, the distribution of the main pollutants in surface water, underground water, soils, agricultural crops and aquatic life were found and their effects on the ecological system and human health were determined.



Attention was paid to comparison of clean and polluted areas, and following a comprehensive evaluation of environmental quality an attempt was made to probe into principles and programs for comprehensive environmental protection in various areas. As a result of the above work, a relatively clear understanding has been gained of the extent and effects of pollution at our country's developmental level and under its technical and economic conditions, and this has given great impetus and incentive to this country's environmental protection work.

## B. Environmental Quality Evaluation

On the basis of the work described in the last section, in order to give a better description of regional environmental pollution, to analyze pollution tendencies and to investigate the effects of pollution treatment, many research institutes have actively pursued environmental quality evaluation studies. Among these, mention should be made of the first method of evaluating water quality and comprehensive evaluation of water bodies, a part of the Guanting water system and sources protection study. In the environmental quality research in the western suburbs of Peking, following an evaluation of the individual factors of atmosphere, surface water, underground water and soil quality, the principles and methods of comprehensive environmental quality evaluation were studied, and a collection of environmental quality maps was compiled showing the natural conditions of the local environments, the nature of their pollution sources, the pollution levels in the main elements of the environment, pollution dispersion models, pollution effects on the ecological system and human health, pollution trend prediction and environmental protection plans and programs. This is the first major result of our country's environmental science and environmental geoscience. In addition, many of our country's environmental science workers have combined their respective research topics and have conducted many-sided research and studies of the evaluation of current and future environmental quality, numerical computation of atmospheric and water quality indices, and geochemical processes in environmental quality variation. This has laid the foundations for further development of these types of work in our country.

Local environmental pollution surveys and environmental quality evaluation research are a basic part of environmental geoscience, but this work must truly be done well and many disciplines must be brought into close association. In reality, all of the abovementioned tasks are accomplished by cooperation between environmental geoscience, environmental biology, environmental chemistry and environmental health.

## C. Investigation of the Laws of Propagation and Transformation of Pollutants in the Environment

For a long time, geochemistry, a branch of geoscience which investigates the laws governing the distribution and movement of the chemical elements within the earth, has primarily served the development and utilization of mineral resources. But in reality, people discovered long ago that the

movement and distribution of the chemical elements at the surface of the earth are closely associated with agricultural and livestock production and human health. The application of geochemical thought and methods to investigation of the laws governing the distribution and movement of pollutants in the environment is helpful in discovering the internal connections between environmental pollutants and human health and in understanding the environment's ability to assimilate pollutants, and is of truly great importance in establishing environmental quality standards and pollutant disposal standards and in carrying out environmental quality evaluations and designating pollution control measures. Since its very beginning, our country's environmental geoscience has accorded great importance to these research areas. The work pursued in the last few years includes: regarding the propagation of pollutants in water: the degradation of and self-purification from phenol, chlorine and other poisons in drainage ditches and streams by aerobic organisms (surface water in the eastern and western suburbs of Peking, Guanting water system, Lanzhou section of the Yellow River and the like) and dilution and diffusion of the substances (Zhenjiang [6966 3068] section of Yangtze River) have been studied; the movement and distribution characteristics of certain heavy metals (mercury, chromium, copper, cadmium, arsenic and the like) in inland water bodies and the sea near river mouths have been studied (surface water in eastern and western suburbs of Peking, Songhua [2646 5363] River, Jiyun [5636 6663] River, mouth of the Yangtze, Jiaozhou Bay and the like). As regards atmospheric propagation of pollutants, diffusion modes of dust and sulfur dioxide in the smoke from certain heavy industrial areas have been studied (industrial region of western suburbs of Peking, Shenyang region); as regards biological propagation of pollutants, the movement, accumulation and persistence of phenol, chlorine, arsenic, mercury, chromium, copper, zinc, lead, cadmium, benzopyrene, and oil in certain sewage irrigation areas' soil-agricultural crop systems are studied (sewage irrigation areas of the eastern suburbs of Peking, Shenfu [3088 2329] irrigation area); and the accumulation and concentration of mercury in the aquatic food chain and in the bodies of certain types of fish was investigated (Guanting reservoir, Songhua River, Jiyun River).

In all the abovementioned research work, in addition to studying the chemical mechanisms of the migration and transformation of pollutants, attention was also paid to investigating the effect of the environmental conditions in various regions on pollutant migration and transformation, and attention was given to areal variations of propagation characteristics. In most of the work, on-the-spot surveys and laboratory simulation experiments were used in close connection. In the on-the-spot studies, the conjugate research method and the tracing method were used and thorough account was taken of the environment as a whole and of the mutual constraint and influence of the various main elements of the environment. In the laboratory investigations care was taken to use modern technical procedures, such as use of neutron activation technology to study the changes of chromium-containing wastewater in agricultural crops and soils; cadmium-115 was used to study the laws of its absorption by paddy rice and its distribution in the plant; carbon-14 was used to tag a methyl chloride

solution and study the persistence of chlorinated substances in the soil and their metabolism and distribution in plants. In the research work, account was also taken of the interaction of various wastewaters after mixing in ditches, and the effects of pollutant interaction with chemical components of the environmental background were studied.

The investigation of the laws governing migration and transformations of pollutants in the environment is an extremely important task, but this work is also an important area of environmental chemistry and pollutant ecology. The various types of work mentioned above are really shared accomplishments of the abovementioned disciplines (separately and in cooperation).

#### D. Investigation of Environmental Background Values

Investigation of environmental background values is a traditional task of geoscience. Currently investigations of the environmental background have two main aspects. One is investigation in combination with regional environmental pollution surveys, and the other is as a separate topic. In all previously mentioned regional environmental pollution surveys there was a "control area" in the survey; the control areas were all selected in regions not subject or only slightly subject to pollution, and in reality this is environmental background research. A rather large-scale environmental background survey that is currently being formally pursued is a survey of the soil background values in 18 municipalities.

#### E. Environmental Zoning and Planning

Environmental zoning work is relatively little developed in this country. Attempts are already being made to develop the following work: "Environmental Protection Zoning in China," and "Fluorine Environmental Zoning in China" and the like. In work on the latter subject, on the basis of the environmental conditions of the various areas of our country, a "Map of Industrial Fluorine Content in China" has been drawn up. In the Guanting water source protection study, protection of water quality in reservoirs was made the center of an attempt to delineate class 1, class 2 and class 3 water source protection regions. All of this is precursor work in environmental zoning.

In recent years, in their expansion some of this country's cities have accorded considerable importance to environmental planning work, and have been careful to investigate the relationship of site selection by polluting enterprises or groups of enterprises and functional zoning in cities. Work already carried out in this area includes: "Questions of Rational Layout of Urban Functional Zones Under Different Prevailing Wind Conditions in This Country's Monsoon Regions," and "The Relationship of Prevailing Winds With Friction Layers At Different Altitudes to Smokestack Heights and Factory Disposition."

Above some of the main work in our country's environmental geoscience has been cited. To sum up, in the last 10 years, our country's young environmental geoscience has already obtained its initial planning results.

### 3. Future Research Prospects

In order to further develop this country's environmental geoscience, we believe that attention in future research should be given to the following topics:

#### A. Laws of Migration and Transformation of Pollutants in the Environment

Research in this area is the basis of environmental quality research. In addition to combined macroscopic and microscopic investigation of the mechanisms of pollutant propagation and transformation in the environment, stress should also be laid on investigating the effects of different environmental backgrounds on propagation of pollutants, and in connection with the specific environmental conditions in different regions investigation should be made of types of diffusion, dilution, degradation and self-purification. The use of relatively good monitoring systems and on-the-spot or laboratory simulation studies systematic data should be collected on various "pollution source + environment" (i.e., pollution field) systems, and systems and dynamic models should be set up; by means of computer modeling the optimal environmental dilution and self-purification systems should be calculated so as to utilize effectively nature's purification abilities; these systems should be linked up with pollution control systems.

#### B. Ecological Effects of Pollutants in the Environment

The effects of environmental pollutants on the health of organisms and man should be investigated in terms of the interaction of the food chain and nutritional levels. This research is a common task of environmental geoscience, ecology and environmental health. Environmental geoscience should focus on investigating the overall environmental network. Biological processes in the individual organism and molecular biology processes insofar as they constitute an indication of the behavior toward the external environment, participate in the environmental network. The focus of research in this area should be on determining a network model of different environments, particularly a systems analytical model.

#### C. Environmental Quality Evaluation Research

In order to improve environmental quality evaluation, research in this area should be based on research in the abovementioned two areas. Environmental quality evaluation includes current evaluation and predictive evaluation, and for already-polluted areas it also includes historical retrospective evaluation, so that it should investigate the processes of change in environmental quality and their development tendencies, and should compile environmental quality evaluation maps stage by stage for a given district at different periods. Comprehensive evaluation indexes should be designated on the basis of different environmental conditions in different areas, their pollution source characteristics and their interaction with pollution effects, and evaluation levels should be distinguished. Account should be



taken of variations in inputs from pollution sources and the nature of regional differences in environmental quality, in order to set up environmental quality evaluation models, which should be used to forecast environmental quality trends.

#### D. Environmental Planning and Management Research

Environmental planning includes water system and water source protection planning and urban environmental protection planning. The goal of water system and water source protection planning is to start from protection of water quality for specific uses, and to plan and arrange rational municipal water and industrial district layout on the banks of the water system. The primary task of urban environmental planning is to select a reasonable siting for an enterprise or group of enterprises which emit certain pollutants. This location not only requires that the engineering geology conditions be in accordance with construction requirements, that it not compete with agriculture for good land, and that the economic zoning be optimal; the polluting enterprises must be downwind of the city and also downstream of it, for only in this way is it possible to achieve the goal of protecting the urban environment, namely that of designating an overall planning program for rational functional zoning which both is in accordance with land use principles and complies with the environmental quality standards. This should be the main focus of environmental planning work. Environmental management research must be based on the laws of natural science research, and it must be implemented by means of specific administrative management measures; it should start out from environmental quality requirements, make use of an environmental economic analysis and designate a legislative management program if it is to work effectively. Work in this area must involve not only scientific workers but must also include economists and lawyers, in addition to economic geographers--geoscientists.

#### E. Investigation of Global Effects of Pollution

Because environmental pollution can, by means of complex interactions among the main elements of the environment, cause the environment to develop in unthinkable bad directions, there arises the problem of certain unpredictable worldwide effects. For example, via the food chain in the ecological system, some species may be threatened with extinction, or some life in the far-off polar regions or in the oceans may be harmed. Some problems of global magnitude of which people are beginning to be aware are: the carbon dioxide greenhouse effect, the solar umbrella effect from floating dust, and the problem of interaction and equilibrium between the two; and the problem of dust decreasing the melting of glaciers, the breakdown of the stratospheric ozone layer and the possibility that this could effect biology and human health. These problems all require serious treatment and investigation. A large proportion of these global problems which are hidden behind local environmental pollution are closely associated with the subject matter of environmental geoscience. Our environmental geoscience must also pursue research work in this area.



Environmental science is extremely comprehensive, and its various branches are very closely interconnected. Environmental geoscience should rely closely on cooperation with other branches of environmental science, but at the same time it can develop rapidly only by firmly grasping its own characteristics and strong points.

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## APPLIED SCIENCES

### RECENT ADVANCES IN ATMOSPHERIC SCIENCE OUTLINED

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[Article by Ye Duzheng [5509 4648 2973] of the Institute of Atmospheric Physics, Chinese Academy of Sciences: "Recent Advances in Our Country's Atmospheric Science Research"]

[Text] Due to production and military needs, and the introduction of new technologies, especially electronic computer and satellite technologies, plus the interdisciplinary diffusion with other sciences, particularly oceanology and mathematics, atmospheric science has developed by leaps and bounds over the past two or three decades. From the mid-1960's to the mid-1970's, in spite of the continuous and serious destruction brought to our country's science by Lin Biao and the "gang of four", owing to the firm resistance put up by the atmospheric science workers at all levels against the counterrevolutionary revisionist line, certain developments have been made in our country's atmospheric science. First, we should mention the developments made in new technical equipment: the meteorological departments throughout the whole country have already installed special electronic computers, including the M170, which is a fairly large system. The 711 radar observation network is basically completed, and right now the 713 radar system is under construction. Satellite cloud picture installations are extensively used among large observatories throughout the country, and, in 1978, synchronous satellite cloud picture installations began to operate. Our country has built its first 325 meter high special meteorological observation tower, and a 164 meter high electric power transmission tower is being utilized for meteorological observation. Besides, quite a few remote sensing devices have been produced, e.g., sonars, laser radars, microwave radiometers for remote sensing of atmospheric temperature and precipitation. The introduction of these new technologies into our country's atmospheric physical science has helped our country to fill in the gaps in this area of science, and opened up new realms, thus adding new life to the old sciences. The relatively extensive application of electronic computers in some areas in our country has enabled our country's atmospheric science to develop its own quantitative and empirical sciences. Owing to the limited space in this article, I shall only briefly touch upon the chief results achieved in our country's atmospheric science in recent years.

## 1. Probing the Atmosphere with Remote Sensing

Our country has already begun to probe the atmosphere with remote sensing on a preliminary scale. Moreover, it has achieved some results in observation and scientific research operations. Through remote sensing of the atmospheric temperature and precipitation, microwave radiometers have been used to find the atmospheric temperature profile situated below 10 kilometers and the total precipitation distribution within the radius of 100 kilometers. Sonars have been used to study the birth and dissipation of boundary layers and inversion layers, as well as the coefficients of the turbulent structure and the gravity waves within the boundary layers. Laser radars have been used for studying such features as oblique visibility, diffusion of smoke clouds in the atmosphere, and the optical characteristics of the lower atmospheric layer.

Over the past year, our country has done quite a lot of research work on the remote sensing of the atmosphere with thermal radiation signals. Some achievements have been attained both in the theoretical study and observation of atmospheric temperature, moisture and precipitation intensity with infrared and microwave remote sensing. Moreover, our country's research work is characterized by the reverse deduction of atmospheric temperature profile with the aid of radiation signals. With full knowledge of the importance and difficulty in determining water vapor in the atmosphere through remote sensing and reverse deduction, we have also conducted theoretical research on this aspect in our country. Besides heat radiation, there is also electromagnetic radiation in the atmosphere caused by atmospheric electricity activity, which led Comrade Gu Zhenchao [7357 7201 3390], the late renowned meteorologist, to come up with "radio meteorology", thus enabling our country to conduct observations on the atmospheric radiometric characteristics, assimilation tests of water drop disintegration with electromagnetic wave radiation, and experimental research on the principle of single-station determination of thunder and lightning, as well as experimental research on artificial lightning.

## 2. Boundary Layer Meteorology

The above-cited instruments can also be used for observing atmospheric pollution in the boundary layer. The 164 meter tall electric power transmission iron tower has already accumulated over a year's data on the wind speed profile of the boundary layer. In recent years, research on the laws of pollution proliferation has been conducted in industrial pollution areas located in some mountain regions, Beijing, Shanghai, Tianjin, Nanjing, Xuzhou, etc., thus providing our country's industrial sector with an abundance of information, data and constructive ideas. Moreover, considerable efforts have been made to study the atmospheric turbulence in the boundary layer, the birth and dissipation of the inversion layer, gravitational wave phenomena in the boundary layer, and winds in mountains and valleys. In foreign countries, the Doppler method is often applied in sonar wind measurements; but our country has introduced the wind measurement correlation method, and encouraging results have been achieved in

preliminary tests. There are quite a few dynamic problems in the boundary layer, and some organizations in our country have been studying these problems on varying scales, e.g. in offshore areas, four-layer models are used for assimilating the structure of the atmosphere and marine boundary layers. Observations on the structure of near surface turbulence have led to the discovery of explosive turbulence. Medium range spreading is one of the major problems in pollution meteorology. Some organizations have been using hexafluorosulphur tracers to study the diffusion patterns in the atmosphere. It is a new and effective technique which has become a new means of studying medium range diffusion.

### 3. Man's Impact on Weather

Our country began work on artificial means of influencing the weather in 1958. As it directly serves industrial and agricultural production as well as water conservancy, specialized contingencies and relatively extensive mass scientific activities have been organized over the past 10-odd years. Quite a few organizations and provinces have conducted numerous observations to study the microstructures of clouds and precipitation, and two noteworthy facts have been discovered through observation: First, stratiformis clouds contain quite a number of ice crystals, ranging from several tens to several hundred per liter. Second, warm cumulus clouds contain many medium and large size water drops. Both facts could reflect the characteristics of cloud layers in our country, which merits in-depth study. Over the past decade, many places have been experimenting with artificial means of influencing cumulus and stratiformis clouds, and they have achieved some results.

Artificial hail prevention is quite extensive in many places, and chiefly fall into the following three areas of work: First, hailcloud observation covers the classification of hailclouds (strong cells, propagation cells, weak cells, multiple cells), cloud height, echo wave displacement speed, structure of echo wave vertical profiles, etc., as well as determination of hailclouds and thunderclouds. Second, research and development of hail-prevention rockets and catalysts. Third, preliminary work on the principles of hail prevention.

### 4. Synoptic Meteorology

This is a relatively basic science in our country. It is also the most extensively studied science among the vast number of observation stations, which involves a very wide area, including general circulation, cold wave, rainstorm, hailstorm, gale, low temperature, overcast rainy weather, as well as general medium and short-range forecasting methods, etc. Synoptic meteorological problems may be summed up in the following few points:

(a) Research on atmospheric circulation and weather situation to solve medium-range forecasting problems.

Large-scale atmospheric circulation situation constitutes the background of relatively small local weather. In studying their inter-relations,

it is often regarded as the starting point for medium-range weather forecasting. This type of work involves research on subtropical zone high pressures, westerly jetstreams, upper air trough-ridge coordination, as well as plum rains, autumn rains and continuous overcast and rain in early autumn. The research also involves the chief differences and conversion characteristics of heavy rain periods and light rain periods, thus providing a starting point and target for forecasting work. There is some research on the major impacts of the Qinghai-Xizang high pressure (South Asia high pressure) on precipitation, droughts and floods in our country; the research findings can be used not only as reference for medium-range forecasting, but also as leads for long-range forecasting.

To further improve medium-range forecasting, many comrades are studying the contributing factors leading to variations in large-scale circulation situation (medium-range process), and ultralong wave research as well. Some methods and instruments have been devised and put to test, e.g. resonance wave analysis, nonmultiple frequency resonance wave analysis, natural orthogonal function method, mean charts and circulation types, weather mean charts and westerly contour lines, as well as low latitudinal indices, etc. Some of them are quite unique. These projects are of practical value and should be strengthened and improved. Other projects involve diagnostic and analytic study of the physical features of medium-range processes.

Departing from the inter-relations between middle and low latitudes, research is done on medium-range forecasting of summer precipitation in our country; after many years of repeated practice and improvement, there appears to be some prospects ahead.

#### (b) Research on Inclement Weather Analysis and Forecasting

Inclement weather research is one of the major projects in our country, and considerable development has been made in recent years. Rainstorms and typhoons have been studied the most. Here we shall discuss rainstorms, and discuss typhoons later on in the section on tropical meteorology.

(1) In the research on major weather systems which cause rainstorms, special emphasis is placed on low vortex and typhoons. It has also been discovered that heavy rainstorms can be caused by disturbances in the lower strata of the atmosphere. Some organizations have begun to study the dynamics of this particular area.

(2) The circulation conditions and physical conditions leading to the occurrence and growth of rainstorms include latent heat, vertical motion, wet tongue, lower jetstream, atmospheric stratification, topographical relief, etc. Particular attention has been devoted to the research on the impact of lower jetstreams. There are indications that rainstorms could be touched off by such major factors as strong thermodynamic forces and critical dynamic forces, lower strata convergence, and gravitation waves, especially the collision of non-continuous lines. Recently, some attention has been given to the impact of the boundary layer on rainstorms



and strong convectional weather. It has been found that the largest horizontal convergent layer is at 500 meters altitude prior to a rainstorm, and both water vapor and heat accumulation in the boundary layer are at maximum values. Over the past few years, the gross energy analysis method was extensively used for studying rainstorms and strong convection weather, and it has thus been revealed that rainstorms and strong convection weather often appear in the vicinity of strong energy peak areas. Three aspects are stressed in the research on circulation background: One, low latitudinal circulation--in almost every instance, extraordinary severe rainstorms in our country are affected by the low latitudinal system; two, impact of weak cold air; three, the obstructive force of subtropical high pressure and the high pressure over the Sea of Japan.

(3) Research on medium-scale rainstorm system has also begun. Case analyses have led to the suggestion that there is a kind of propagation mechanism in medium-scale rainstorm systems, which merits attention and should be further determined.

(4) Rainstorm analysis and forecasting method research. Introduced several years ago, the energy analysis method has been extensively used and developed.

Rainstorms have always been a hard problem in synoptic meteorology as they involve interactions among different scales. Progress has been made in this area of research, but there is still room for further improvement. On the one hand, there is need to improve the observation network and enhance data gathering. On the other hand, there is need to increase diagnostic analysis and dynamics research, especially medium-scale dynamics and moist air dynamics. Owing to the limited observation network, not much research has been done on medium-scales. Encouraging results have been achieved in secondary weather scale analysis and related moist air dynamics, a unique creation by our country which had been put to trial use this year. But there is still a long way to go in finding a solution to short-range rainstorm forecasting, an area which should be further explored.

#### (c) Satellite Meteorology

Our country began collecting meteorological satellite data in 1969. Today, it has also begun picking up cloud pictures from Japan's geostationary meteorological satellite, and the cloud pictures are extensively used in weather analysis and prediction in the Qinghai-Xizang Plateau area, as there is a great lack of common data in this region. It has been discovered from the satellite cloud pictures that cold waves and cold fronts often move across the plateau in winter. Before, forecasters could not agree as to whether there were warm fronts over the plateau. The satellite cloud pictures have helped to confirm the fact that warm front activities do occur over the plateau. Cloud picture analyses also indicate that sometimes the Indian monsoon low pressure cloud system and swelling clouds from the tropical zone can cross over the Himalayas and extend all the way to the plateau. The tropical cyclones from the Bay of Bengal

can also affect the plateau weather. When India is hit by a storm, if an upper trough crosses the border, then the two cloud systems will link up and produce heavy precipitation over the plateau.

Satellite cloud pictures are useful for monitoring marine weather systems. From cloud picture analyses, four broad types of clouds generated and developed from offshore typhoons have been classified: The first type comes from single cloud clusters which grow and develop; the second type is developed from two cloud bands which rotate around each other and eventually merge together; the third is developed from two merging cloud clusters; and the fourth is developed from scattered cumulonimbus groups which become organized. From satellite cloud pictures, it has also been found that the type of westerly circulation in the southern hemisphere is related to both the equatorial convergence belt and typhoon activities in the West Pacific. For example, according to observations made in June-August 1978, whenever Australia was hit by cold waves, typhoon activities also occurred in the West Pacific Ocean. Besides, cloud pictures are also very useful for monitoring disturbances in the tropical seas which are difficult to analyze from ordinary weather charts.

Our country has also been using satellite cloud pictures to analyze rainstorms and thunderstorms on the continent. Cloud-picture infrared signals picked up by the APT are broken into 64 optical levels and fed into the electronic computer to be processed into digital cloud pictures. Together with corresponding 6-hour precipitation information, the preceding data is analyzed and translated into the relations between the corresponding luminant units and plum rain peak 6-hour precipitation. This way, digital cloud pictures can be used for statistical computation of 6-hour precipitation.

In sum, satellite cloud pictures have contributed to weather analysis and forecasting in our country, and other types of satellite data will also play a role in our country's meteorological applications in the future.

## 5. Tropical Meteorology

Some progress has been made in tropical meteorology. The surface air pressure near the equator is used as an index in finding the characteristics and conversion patterns of the tropical circulation in the West Pacific Ocean, i.e. the alternating changes between subhigh and equatorial buffer connections as well as the monsoon trough and tropical convergence connections. There have been discussions on the relations between tropical circulations in high and low strata and typhoon activities. Discussions on the tropical circulation features during the strong and weak convergence periods in the West Pacific Ocean indicate that the features merely reflect part of the global circulation changes, and there is a certain degree of coordination between the upper and lower air tropical systems. Moreover, during the strong convergence period, there is an east-west circulatory cell which rises on the east side of the Pacific equatorial area and falls on the west side. Similar results have been achieved in discussions on

the characteristics of the cold and warm maritime circulation in the East Pacific. Discussions on the primary source of air currents in the West Pacific indicate that most of the air current along the southern edge of the convergence zone in this area comes from the southern hemisphere, and crosses the equator in the vicinity of Kalimantan and 150-160°E. Wave spectrum analysis has led to the discovery of a quasi-periodic oscillation in the tropical circulation lasting about 2 weeks in South Asia, South China Sea, and the Pacific Ocean; preliminary analysis has been made on its mechanism as well. There are quite a few research projects on the activities and structures of tropical convergence belts over the Indochina Peninsula, South China Sea and West Pacific Ocean, thus producing the vertical distribution of dynamic and thermodynamic parameters in the convergence zones of the preceding areas. Mesospheric cyclones have been discovered in the South China Sea area.

Typhoon research has been focused on the prediction of typhoon paths over recent years. To make the forecasts objective and quantitative, nine objective prediction methods have been introduced, such as the multiple-factor regression method, the double-layer air stream steering correction method, the similarity method, dynamic statistics, etc. A barotropic initial equation model has been developed for predicting typhoon numerical values. Its feature lies in the use of the four-step finite difference method, plus on-the-spot correction of the predicted positions of typhoons following their initial stage. Striking improvements have been made in the outcome. In the study on the birth and growth of typhoons, emphasis is placed on the analysis of their relation with the surrounding stream field; a set of prediction model diagrams have been designed for determining birth and growth possibilities. A statistical prediction method has been developed for tropical low pressures over the South China Sea. Further developments include detailed analysis of offshore typhoons erupting over cold shear disturbances in fall, and discussions on the impact of the West Pacific tropical convergence activities on typhoon growth, and circulation conditions leading to the simultaneous development of multi-typhoons.

In recent years, there has been relatively systematic research on environmental streamline fields, physical factors and mechanism of land-striking typhoon precipitation. Excellent results have been achieved through the use of single station elements and by drawing on the experiences of the masses.

Typhoon researchers have also been experimenting with fluid dynamic models of typhoons to study such problems as typhoon structure and migration. For example, it has been discovered that whenever typhoons migrate from the east to the vicinity of Taiwan, a new typhoon center appears on the west side. Such phenomena can serve as basis for prediction.

Considerable progress has also been made in numerical forecasting and the dynamics of the tropical zone; and a model has been designed from the semi-concealed tropical barotropic initial equation which can be used for

actual wind measurements. A preliminary four-layer initial equation model has already been designed. Trial forecasting of specific cases show that it has a certain capacity for prediction.

#### 6. Qinghai-Xizang Plateau Meteorological Research

In recent years, our country has made considerable progress in the meteorology of the Qinghai-Xizang Plateau. First, under the guidance of the Plateau Meteorology Scientific Research Coordination Group, quite a few excellent results were achieved in a number of scientific research projects.

For instance, the climate project produced over a hundred different kinds of climate charts which enabled plateau meteorology to make a big stride forward. The participants in the summer Qinghai-Xizang high pressure project have developed a relatively deep understanding of the impact of this huge system on our country's circulation and weather, and can make predictions as well. The participants in the plateau low value system project have conducted relatively in-depth research on the occurrence and development, and structure of low vortex over the plateau, and have thus come up with new bases for forecasting it.

The source of cold and heat on the plateau is an important problem. Through quantitative computation, we now have a quantitative concept of its annual changes, which has thus enabled us to study its effects on circulation and weather. It has been discovered that in summer, the circulation over the plateau is remotely correlated to circulations in distant regions--such as the East Pacific and southern hemisphere. It has also been found that due to the impact of the cold and heat sources on the plateau, during the summer season, the near-surface warm low pressure over the plateau and the warm low pressure in India do not belong to the same system on the mean chart; instead, they are two different systems separated by a narrow high pressure belt. But, in winter, the plateau has its own high pressure system on the 600 millibar mean chart; thus, the plateau has its own monsoons. Moreover, the annual changes in the plateau's heat sources play a major role in East Asia's annual circulation variations.

In recent years, our country has done quite a lot of work on plateau weather systems and their effect on weather throughout the country. There has also been a great deal of research on the forecasting of such systems.

The plateau has great impact on the formulation of our country's climate, and it also effects the long range weather processes in East Asia. For example, exceptionally large (or small) accumulation of snow on the plateau in winter is correlated to the relatively late (or early) arrival of summer circulations.

Qomolangma Feng (Mount Jolmo Lungma) is the highest mountain peak in the world. We all know about the weather and climate in this area. Over the recent years, our country's meteorologists have gathered an enormous amount of data in this region; they have not only learned about the distribution of various climatic elements on the northern slope, but also about the



local glacier structure, various types of special cloud systems, and many weather phenomena caused by the topographical relief such as the vortex movement.

In recent years, our country has achieved certain results in assimilating the effects of the Qinghai-Xizang plateau on circulations with the use of rotating fluids.

## 7. Long-Range Forecasting and Meteorological Research

### (1) Long-Range Forecasting

Long-range forecasting is closely tied in with the construction of national economy, particularly agricultural production. And yet, it is also a difficult problem confronting the world. Some developments have been achieved in this area by our country's meteorological departments, including many observation stations. A couple of years ago, various organizations began an extensive general survey of the early-period indices based on the 500 millibar monthly mean circulation and the monthly mean circulation of all the layers in the stratosphere, which, in addition, enabled them to find the astronomical significance of the indices. Emphasis was placed on studying the development of circulations during the initial periods of floods and droughts, particularly the connection between the seasonal variation of the atmospheric circulation and floods and droughts. With preliminary results, quite a few organizations studied the long-range weather processes which caused natural calamities in various regions, and a fairly detailed research was made on the effects of long-range weather processes on the low temperature weather in China's northeast region in summer.

In the early 1970's, a new factor--sea temperature--was introduced into the long-range forecasting research. At first, the researchers were only interested in studying the forecasting relations. Now, quite a lot of effort is spent on probing into the physical processes of sea-and-air interaction. Besides focusing on the relations between sea temperature anomaly and long-range weather processes, they are also studying the coupling oscillation between sea and air from the dynamic and thermodynamic point of view, thus enhancing their understanding of the annual periodic activities of long-range weather processes. Over the past few years, practice has proven that observations on the sea temperature is an effective means of long-range weather prediction, and it has now become one of the chief long-range forecasting methods employed by our country's meteorological and hydrological departments. The sea and atmosphere constitute a complex feedback system; in recent years, foreign countries have begun to focus their attention on the circumstantial effects of the atmosphere on the sea, which has also caught our attention. The in-depth research on sea-and-air relations is bound to bring tremendous impact on the improvement of long-range forecasting. Besides sea temperature, attention is also focused on such factors as snow accumulation, land surface temperature, etc.



Based on many years of work, our country has sorted out a fairly large volume of data on atmospheric circulation; the information is quite complete and provides an extremely important foundation for building up our long-range forecasting work. Today, we already have 500 millibar mean charts covering the northern hemisphere month by month since 1951; we also have January, April, July and October sea surface air pressure charts of the southern and northern hemispheres dating back to 1871. These data have already begun to play a preliminary role in long-range forecasting.

At present, we have two long-range numerical forecasting projects. The first consists of using the early-stage circulation data as basis for predicting the following month's lower cushion surface temperature field, which, in turn, is used to forecast the following month's circulation. In the second project, monthly mean circulation predictions are based on the historical development of the monthly mean circulations. Preliminary tests in the first project have produced some results. The second project is still in the testing stage. At present, foreign countries have not done much in long-range numerical forecasting.

Besides, in recent years, quite an amount of work has been accomplished in using the statistical method and statistical-dynamic method to study such problems as natural seasons, drought/waterlogging and monsoon, monsoon and the atmosphere circulation. Efforts are also being made to summarize and develop farmers' proverbs and mass experiences.

## (2) Meteorological Research

Since 1973, when Premier Zhou instructed us to make thorough study of climatic anomalies, research work on climatic variations and super long-range forecasting has developed extensively. In sorting out climatological historical data, our meteorologists have produced the first historical rainfall distribution chart (February 2-5, 1736) based on some 2,100 kinds of regional journals, records from the Ming and Qing Dynasties, biographical history books, Qing Dynasty files in the Palace Museum, Qing Dynasty books, etc., from which they have also succeeded in deducing the cold air circuits of the past. Moreover, based on recent surveys of drought and waterlogging conditions in various parts of the country and rainfall data measured with modern instruments, they have sorted out historical materials on droughts and waterloggings since 1470. Our meteorologists have also graded the annual droughts and waterloggings from 1470 through 1977, covering 118 representative stations throughout the whole country, and plotted a whole set of drought/waterlogging grade distribution charts covering the entire country over the past 500 years. Through analyses and research, it has been discovered that besides periodic cycles measuring 36 years, 22 years, and 2-3 years, it is possible that the large-scale drought/waterlogging variations in our country also follow a periodic cycle of over 200 years. Based on historical records containing data on cold waves, frosts, great droughts and severe waterloggings, as well as analysis of instrument observation data dating back to the beginning of this century, there have been discussions on the main features of climatic

variations in our country since the 15th Century, which has helped us to formulate a preliminary and rough idea of the climatic changes that have taken place in our country over the past 500 years.

Most provinces in our country have begun to study tree ring climatology. Through analysis of tree rings and the lengthening of climatic arrays, it was possible to examine climatic variations in the western portion of our country which are rarely found both in observation data and historical materials. Through analytical study of tree rings, spore-pollen, historical accounts, and records on natural phenomenal variations, preliminary analysis has been made on the climatic changes in the Qinghai-Xizang Plateau over the past 2,000 years. In addition, the meteorologists have conducted preliminary examination of climatic conditions before and after the formulation of the Qinghai-Xizang Plateau, and the plateau's climatic zones as well.

Super long-range forecasting is a new experimental research project that began in 1973. Based on experiences from the masses, stage analysis, time order analysis, solar activity and such influential factors as the lower cushion surface, the meteorologists have studied the possibilities of super long-range forecasting.

Over the past year, we have processed cloud pictures into data and charts revealing the radiation balance and heat balance throughout the whole country, and developed practical means of studying the radiation balance in complex reliefs. We have also made preliminary analysis of the influence of man's activities on local climatic changes. These are all basic research projects which are of important significance to our country's physical-dynamical climatology.

## 5. Atmospheric Dynamics and Numerical Forecasting

The history and practice of the development of meteorology indicate that theoretical work plays an important role in meteorological research and development. In recent years, everyone has further distinguished between right and wrong, cleared up their minds, and thus acquired a fairly good idea of the crimes committed by the "gang of four" who tried to disrupt and sabotage theoretical research work. The importance of theoretical work is being increasingly felt by everyone. We are happy to note that theoretical work and research are not only being conducted in scientific research organizations and institutions of higher education, but also in many meteorological observatories and stations who are combining them with their own work needs. Our country's meteorological research work has taken on a new atmosphere, which covers a wide variety of projects, including atmospheric dynamics, such as adjustment process, theory of instability, sea-air boundary layers, topographical effects, interaction among movements of various scales, etc; construction and comparative study of various types of atmospheric models. Quite a lot of effort has been put into some major problems in numeric forecasting, such as objective analysis, initial value, cumulus convection, etc. Our meteorologists have

also begun to study some basic theoretical problems, such as the basic properties of rotating fluids, and they have already achieved some initial results in this area. Many of the research problems are major problems which not only concern current operations, but also the international community. What should be noted, in particular, is the fact that due to the relatively extensive use of electronic computers among the broad ranks of meteorologists in our country, China's meteorological research has begun to enter the quantitative and experimental science stage, which is a great step forward. All this indicates that over recent years, particularly since the downfall of the "gang of four", our country has achieved quite a lot in theoretical meteorological research work.

(a) Research on the adjustment process in the rotating atmosphere through comparative study of systems helped to formulate theories on systems in which geostrophic adjustments occur in local disturbances (including the nonlinear theory). It also led to the introduction of the concept of multiple time dimensions. Furthermore, our studies of global stream field evolution indicate the existence of geostrophic adjustments, i.e. in the absence of source sinking, and given certain conditions, the planetary wave energies become totally absorbed by zonal circulations in the end. It is an important mechanism which sustains the zonal circulation and atmospheric circulation during the middle period of their development.

(b) Research studies on the spiral structure of planetary waves indicate that the spiral structure of both horizontal and vertical planetary waves are produced by basic airstream shearing and the variation of the Coriolis parameter. Spiral waves can cause dispersion and play an important role in energy transfer as well as sustaining the atmospheric circulation.

(c) The Qinghai-Xizang Plateau has remarkable influence over the East Asian Atmospheric circulation and weather development. We have achieved some results in studying its thermodynamic and dynamic effects. For instance, when a protruded mountain is equivalent to a fixed cyclonic stream field, its effects on a temperature field become equivalent to a warm center. We have also studied many dynamic problems related to it, and looked into dynamic problems of ultra-long waves.

(d) Through research on strong convections in coordination with rainstorm prediction and plateau effects, we have found inertial convective motions in the Coriolis force field, and our findings indicate that static equilibrium is almost detrimental to medium-scale forecasting. New results have also been achieved in nongeostrophic instability and nonlinear gravitational waves.

(e) There are also research projects dealing with low latitudinal dynamics, and some results have been achieved in such areas as the development of disturbances in easterly airstreams and the boundary surface between easterly and westerly winds; and the dynamics of interaction between two typhoons.

(1) Efforts are made to study mathematical problems related to atmospheric dynamics, probe into the proper way of defining and qualifying the initial-boundary values of various types of models, and compare simplified models to find their applicable ranges.

(2) We have designed some time and spatial finite difference forms that are flexible and energy conserving, as well as some high-precision finite difference forms and spectral models. Summative forecasting models of the P (air pressure) and  $(\sigma P/P_0)$  mixed coordinate system have been designed and used for computing forecasting maps. Three-layer initial equation models and corresponding objective analyses have been put to practical use. Quite a lot of research has been done on computing mathematical problems, processing initial fields, and parameterization. Encouraging progress has been made in research studies on the development of cyclones in Jianghuai, and other major weather processes as well.

#### 4. Agrometeorology

Agrometeorological work and research have developed extensively throughout the country. Except for certain provinces, experiments and scientific research work have been conducted on varying levels everywhere. The contents include agricultural climate, agrometeorological forecasting, farmland microclimate, major agrometeorological disasters, relations between agricultural production and meteorological conditions, and the research and development of instruments. Crops under study include rice, wheat, cotton, corn, soybean and rubber.

In agricultural inclement weather, a great deal of work has been made in studying cold dry wind indices, occurrence patterns, weather/climate types, physiological mechanisms and preventive measures; and some achievements have been made in putting the results to actual service. We have also done a lot of research on the physiological mechanism and occurrence patterns of "dry hot wind" calamities, and looked into preventive measures such as irrigating water, spraying plant ash and phytohormonal growth promoters, etc. We have probed into the indices, occurrence patterns and physiological mechanisms of low temperature cold disasters in northeast China, and all kinds of preventive measures as well. Over the past 10 odd years, a lot of work has been done in studying the inclement effect of cold waves on rubber trees in winter; it involved such projects as analyzing the meteorological effects of mountain climate on rubber tree cultivation in South China, and measures to protect rubber trees against the cold. A great deal of research has been conducted on agrometeorological conditions for hybrid rice growth and sowing, and the agrometeorological basis for the sowing period of parent crops.

Agrometeorological resource research is a very important strategic problem. Our country has complex natural conditions, a great variety of crops, and the agrometeorological resources vary greatly from place to place. Thus, it is imperative to make in-depth and careful investigation of agroclimatic

resources for breeding and introducing crop varieties, and also for reforming the cultivation system and agricultural technical measures, as this is the only way to keep in line with local conditions and provide climatic basis for the state's agricultural plans and modernized agriculture. A great deal of work has been accomplished in this area! For example, research on the overall distribution of rice crop varieties, the problem of heat resources for interplanting, intercropping and multiple cropping in the northern regions of China; light, heat and water resources in the south-west corner of Hainan Island; Xinjiang's agroclimatic seasons, etc. In recent years, some work has been done in the theoretical aspect of agrometeorological research. For instance, assimilation tests and model research projects. These projects are bound to be of great help to the in-depth understanding of some of the major agrometeorological theoretical problems in the future.

Farmland microclimate research is aimed at the popularization of interplanting and intercropping in the northern regions' agricultural production. Many organizations are conducting observation and theoretical study of ventilation and light conditions in farmland, as well as crop evaporation. Farmland microclimatic resources surveys are one of the major scientific research projects proposed by the National Science Conference, and they are carried out in many provinces, cities, and autonomous regions, which has helped to promote the development of farmland microclimatological research work, thus producing theories and methods for data processing, and computation of the values of meteorological elements. Some organizations specialize in the microclimatic effects of greenhouses, plastic canopies which are used to protect cultivation. They are studying assimilation models as well as farmland microclimatic effects that can be used as means of preventing certain kinds of agrometeorological calamities.

From the preceding discussion, we can see that the broad ranks of our country's meteorological workers who are resolutely opposed to Lin Biao and the "gang of four" have done a lot of research work. Although we have achieved quite a lot, compared with the world's advanced level, our country's meteorological research is still lagging behind not only in scale and depth, but also in the technical and theoretical aspects of sounding and observation. Under the guidance of the Party Central Committee led by Chairman Hua, we will strive our utmost to materialize the four modernizations!

The author would like, especially, to express his appreciation to Ding Yihui [0002 0001 0565], Zeng Qingyun [2582 1987 1317], Shen Rujiu [3088 1172 6855], Chen Liting [7115 3525 1656] and Chen Longyun [7115 7127 0534] for their great assistance in preparing this article.

9119

CSO: 4008



# DRAG REDUCTION BY JET OF POLYMER SOLUTION STUDIED

Beijing LIXUE XUEBAO [ACTA MECHANICA SINICA] in Chinese No 4, Oct 78  
pp 326-331

[Article by Wang Xiliang [3769 6932 5328] and Xia Changsheng [1115 7022 1932]: "Theoretical and Experimental Study of Drag Reduction by a Jet of a Polymer Solution with a High Reynolds Number"]

[Text] The addition of a small amount of a drag reducing polymer can greatly reduce drag due to friction in flowage close to a wall. The interest in engineering lies in the theoretical and experimental study of drag reducing polymers in a seam-jet [a jet of a liquid that forms a line between abutting edges] with a high Reynolds number.<sup>1-3</sup> The results of our studies in this regard are reported as follows:

## 1. The Differential Equation of the Shearing Stress on a Wall Surface in a Seam-Jet of a Drag Reducing Polymeric Solution in a Circumfluous and Streamlined Revolving Body

This method is based on the velocity distribution in the joint boundary layer discussed in references 4, 5. Its equation is:

$$u^* = \frac{u}{v_*} = Aay^* + B + bay^* + \Delta B \quad (1)$$

where  $u$  is the velocity component in the  $x$  direction inside the boundary layer;

$$y^* = y_0/r_0, \quad r_0 = \sqrt{x_0/\rho}$$

is the shearing velocity,  $\tau_0$  is the shearing stress on the wall surface,  $\rho$  is density;  $A$ ,  $B$  are constants,  $A = 2.5$  and  $B = 5.5$ ;  $\nu = \frac{\tau_0}{\rho} \frac{dp}{ds}$ ,  $\nu$  is the kinematic viscosity,  $p$  is pressure,  $\Delta B = f(x_0/r_0)$ ,  $f = f(x)$  is related to concentration  $c$ ,  $V_{acr}$  is the shearing speed at the time when drag reduction is produced;

$$b = \begin{cases} 0, & \text{at zero or when pressure gradient is negative} \\ 0.6, & \text{when pressure gradient is positive} \end{cases}$$

the continuous equation of circumfluous revolution is:

$$\frac{\partial(ru)}{\partial x} + \frac{\partial(rv)}{\partial y} = 0 \quad (2)$$

when the method of negligence is affected by stress, the kinematic equation is:

$$u \frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} = -\frac{1}{\rho} \frac{\partial p}{\partial x} + \frac{1}{\rho r} \frac{\partial(rv)}{\partial y} \quad (3)$$

where  $x$  and  $y$  represent respectively the directions of the tangent line and the normal line of the profile of the body on the meridional plane;

$r = r_0 + y \cos \varphi$ ,  $\varphi$  is the angle between the axis and the  $x$  direction,  $r_0$  is the distance between the axis line and a point on the surface of the object (Figure 1).

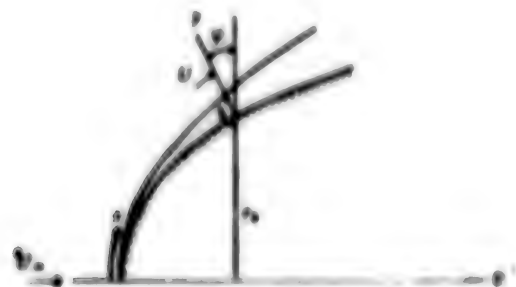


Figure 1. Coordinates of a revolving body

Let the boundary layer be a thin boundary layer with thickness  $\delta \ll r_0$ , then from equation (2) we obtain by integration:

$$r u^2 \frac{dr}{dx} = r y^2 \left[ \frac{1}{2} \frac{d}{dx} y^2 + \frac{\partial(\Delta R)}{\partial x} \right] = \frac{r}{2} \frac{d}{dx} y^2 \left( u^2 - \frac{b y^2}{2} - A \right) \quad (4)$$

$$\begin{aligned} \frac{\partial u}{\partial x} &= \frac{\partial}{\partial x} \left[ r_0 \left( \frac{1}{2} y^2 + b y^2 + B + \Delta R \right) \right] = \frac{dr_0}{dx} \left( u^2 + A + \frac{b y^2}{2} \right) \\ &+ \left[ \frac{1}{2} y^2 \frac{d}{dx} + \frac{\partial(\Delta R)}{\partial x} \right] r_0 \end{aligned} \quad (5)$$

Substituting equations (4) and (5) into equation (3), and keeping in mind

$$\begin{aligned} u^* v_* \frac{dv_*}{dx} y^* \left( A + b_* - \frac{du^*}{dy^*} \right) &= 0, \text{ we have} \\ u^* v_* \frac{dv_*}{dx} + b_* \frac{d}{dx} \left[ u^* y^* - \frac{1}{2} y^{*2} \frac{du^*}{dy^*} \right] &= \frac{1}{r} \frac{dr}{dx} v_*^2 y^* \left( u^* - \frac{b_* y^*}{2} - A \right) \frac{du^*}{dy^*} \\ + v_*^2 \left( u^* - y^* \frac{du^*}{dy^*} \right) \frac{d(\Delta H)}{dx} &= - \frac{1}{\rho} \frac{dp}{dx} + \frac{1}{\rho r} \frac{\partial(\tau)}{\partial y} = U \frac{dU}{dx} + \frac{v_*}{\mu} \frac{\partial \tau}{\partial y^*} \end{aligned}$$

Integrating the above from 0 to  $\delta^* = r_* \delta / \nu$ , we have

$$\begin{aligned} v_* \frac{dv_*}{dx} G + b_* \frac{d}{dx} H &= \frac{1}{r} \frac{dr}{dx} v_*^2 \delta^* \left[ \left( A + \frac{b_* \delta^*}{2} \right) \sigma - \frac{1}{3} \mu_* \delta^{*3} \right] \\ &= \frac{1}{2} A b_* \delta^* + 2A^2 + v_*^2 \delta^* (\sigma - b_* \delta^* - 2A) \frac{d(\Delta H)}{dx} \\ &= U \frac{dU}{dx} \delta^* - \frac{v_*}{\mu} \tau_* \end{aligned} \quad (6)$$

where  $U$  is the velocity of flow at the outer edge of the boundary layer;  
 $\mu$  is the viscosity coefficient;

$$\begin{aligned} \sigma &= u^* \Big|_{y^*=\delta^*} = \frac{U}{v_*} \\ G &= \int_0^{\delta^*} u^{*2} dy^* = \delta^* \left[ (\sigma - A)^2 + A^2 - b_* \delta^* \left( \sigma - \frac{1}{3} b_* \delta^* - \frac{1}{2} A \right) \right] \\ H &= - \frac{\sigma \delta^{*3}}{2} + \int_0^{\delta^*} y^* u^* dy^* = \frac{\delta^{*3}}{2} \left( \sigma - A - \frac{2}{3} b_* \delta^* \right) \end{aligned}$$

Then we nondimensionalize equation (6). Let  $V = U/U_\infty$ ,  $\bar{x} = x/L$ ,  $\bar{y} = y/L$ .

Here,  $U_\infty$  is the velocity of the oncoming flow far ahead, and  $L$  is the length of the object. Finally, we obtain the differential equation of the shearing stress of the seam-jet in a revolving body as

$$\begin{aligned} (G - \mu_* H) \sigma' + \frac{V'}{V} \sigma (\sigma^2 \delta^* - G) &= \sigma^2 \left( \frac{1}{V} \right)' \frac{\mu H}{R_1} \\ + \frac{V'}{V} \sigma \delta^* \left[ \left( A + \frac{b_* \delta^*}{2} \right) \sigma - \frac{1}{3} \mu_* \sigma^2 \delta^{*3} - \frac{1}{2} A b_* \delta^* - 2A^2 \right] \\ &= \sigma \delta^* (\sigma - 2A - b_* \delta^*) (\Delta H)' = R_1 V \end{aligned} \quad (7)$$

where one and two apostrophes denote the first and second derivatives of  $\Delta B$ ;  $Re = U_\infty l / \nu$

$$(\Delta B)' = \frac{\Gamma}{l} (\Delta B) + \Gamma \left( \frac{V''}{V} - \frac{g'}{g} \right) \quad (8)$$

## 2. Discussion of the Differential Equation of Shearing Stress

1) When  $\Delta B = 0$ , equation (7) becomes the shear differential equation of the circumfluous revolving body without additives.

2) From equation (8) we see that when a solution flows over an even flat plate,  $(\Delta B)' = (-\Gamma g')/l$ , and equation (7) becomes

$$\theta'' [(g - A)' + A' + \Gamma(g - 2A)] \theta' + R_l V \theta \theta' [(g - A)' + A' + \Gamma(g - 2A)] \frac{d\theta}{dR_l} = 1 \quad (9)$$

Equation (9) can be solved when  $\Gamma/A$  is a whole number yielding

$$R_l = e^{\frac{1}{\Gamma} (g - A)} \left[ a_{(1,0)} + (\Gamma + 2A) a_{(1,1)} - 2A(\Gamma - A) a_{(1,2)} \right] \quad (10)$$

where

$$a_0 = A e^{\frac{1}{\Gamma} (g - A)}, a_1 = A (e^{\frac{1}{\Gamma} (g - A)} + \frac{\Gamma}{A} a_{(1,1)})$$

When  $\Gamma/A = 0$ , this is the solution of circumfluous flow over a flat plate without additives. The friction drag coefficient of circumfluous flow over a flat plate<sup>2</sup>

$$C_f = \frac{2}{R_l} \int_0^{y^*} \frac{dR_l}{\sigma^2} = \frac{2}{R_l} \left[ \frac{1}{\sigma} \int_0^{y^*} u^2 (\sigma - u^2) dy^* \right]$$

for this model yields

$$C_f = \frac{2A \theta'' (g - 2A)}{R_l \sigma} \quad (11)$$

In pure water,  $\Gamma/A = 0$  and  $U_\infty = 10$  m/s. The relationship curve between the Reynolds Number  $Re$  and  $C_f$  of a solution of polyethylene oxide of  $v_a = 0.023$  m/s at different concentrations  $\Gamma/A = 1, 2, 5$  is illustrated in Figure 2.

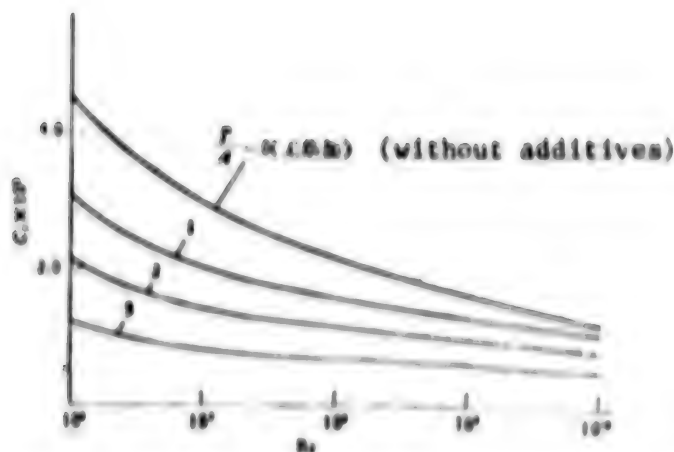


Figure 2. Curve of drag coefficient of an Even Solution Over a Flat Plate

3) In pure water, the condition for circumfluous separation is  $G - 3\delta H = 0$ . When a drag reducing polymer is present, the condition for separation is

$$G - 3\delta H + \Gamma \delta^* (\sigma - 2A - bA\delta^*) = 0$$

The additional third term is generally greater than zero. When separation exists, this can be regarded as a backward shift of the point of separation (when an additive is present,  $\sigma$ ,  $\delta^*$ ,  $G$  and  $H$  also change). In actuality, this is the curve  $\tau_w/\rho U^2 = 1/\sigma^2$  of the coefficient of the shearing stress of the wall surface obtained from computation of equation (7). In pure water, the  $V'/V$  and  $\bar{r}'/\bar{r}$  at the tail end of the revolving body are both negative with a relatively large magnitude forcing  $\sigma'$  to increase rapidly and the curve  $\tau_w/\rho U^2$  tapers off. When  $\tau_w/\rho U^2 \rightarrow 0$ , separation occurs. When an additive has been added, the additional term  $\Gamma \delta^* (\sigma - 2A - bA\delta^*)$  causes an increase in the coefficient value of the  $\sigma'$  term, and slows the decline of the curve  $\tau_w/\rho U^2$  caused by  $V'/V$  and  $\bar{r}'/\bar{r}$ , delaying the occurrence of separation.

4) To solve equation (7), it is important to establish the equation of the concentrations on the wall distributed along the vertical direction and to derive from it the expression for  $(\Delta \sigma)'$ . When the diffusion of the hypothetical seam-jet of polymer in the boundary layer is similar to the pattern of diffusion of a near source in the boundary layer of a turbulence, the concentration of its final section on the wall is

$$C_w(x) = g/0.55 \delta U \quad (12)$$

where  $g$  is the amount of the jet per unit length.<sup>7</sup> When  $\Gamma$  is directly proportional to  $C$ , equation (12) can be rewritten as

$$\Gamma \delta^* = \text{constant} \quad (13)$$



From equation (13), the expressions of  $\sigma$  and  $\Delta B$  can be considered and derived as

$$\begin{aligned} (\Delta B)' &= [K_1(u + F + \Delta B - 3hs\theta') - (F + \Delta B)] \frac{\sigma'}{\sigma} \\ &+ [F - K_1(F - 2hs\theta')] \frac{V'}{V} - K_1hs\theta' \frac{V''}{V'} \end{aligned} \quad (14)$$

where

$$K_1 = \frac{\Delta B}{\Delta B - A - hs\theta'}$$

### 3. Reduction of Drag of a Revolving Body and a Seam-Jet on a Flat Plate and the Experiment in Measuring Concentrations on the Wall Surface

#### 1) General Explanation of the Experiment

The models used for the experiment were a flat plate and a revolving body. The flat plate was 3.0 m long and 25 mm thick. The two ends were sharpened. At a distance of 0.165 m from the tip of the flat plate was a jet 0.8 mm wide and at an angle of  $30^\circ$  from the surface of the flat plate. At the time of experiment, 0.338 m of the flat plate was below water level. Six sampling seams of effective lengths between 30 and 35 mm and of a width of 0.25 mm were located along the vertical line. Their positions have been listed in Tables 1 and 2. The revolving body was 5.463 m long. At a distance of 0.439 m was a ring shaped jet of 0.8 mm in width and at an angle of  $7^\circ$ . Seven sampling seams in the circumferential direction similar to those on the flat plate were situated along the vertical direction. Here, samples were taken by vacuum suction. The amount of the samples was about  $0.3 \text{ cm}^3/\text{s.cm}$ . The concentration was measured by turbidity. To a solution of 10 cc was added 1 cc of 50 percent sulphuric acid and 1 cc of phosphomolybdic acid. The contents were shaken to even the mixture and then set aside for 10 minutes. Then a model 72 spectrophotometer was used to measure the value of photodensity. The drag reducing agent was polyethylene oxide of 3 million molecular weight. Concentration of the jet was 500 ppm, exerting 1 kg/a upon the flat plate and 0.76 kg/a upon the revolving body.

#### 2) Results of the Experiment

Figure 3 and Figure 4 separately show the results of the experiments of the seam-jets on the flat plate and the revolving body. The experimental Reynolds numbers were respectively  $3 \times 10^6 - 2.7 \times 10^7$  and  $5.5 \times 10^6 - 5.4 \times 10^7$ , and the greatest reduction in friction drag was 45 and 39 percent, respectively. When the amount of the jet and concentration of the jet were the same, an increase in velocity brought about a slight drop in the value of drag reduction. The drop in the value of drag reduction was more visible

with the flat plate than with the revolving body. This was because of the effect of the free surface. At high velocities, the flat plate absorbs less water.

The results of the measurements of concentration of the seam-jets on the wall surface of the flat plate and the revolving body have been listed in Table 1 and Table 2. In the tables,  $V$  is the velocity of flow (m/s),  $Q$  is the amount of the jet (kg/s),  $C_j$  is the concentration of the jet (ppm),  $C_w$  is the concentration on the surface of the wall (ppm) and  $x$  is the distance from the tip (m). The \* indicates that after a jet sample at  $C_j = 1000$  ppm was taken the sample bottle was not thoroughly cleaned and thus the concentration was slightly higher.

Results of the measurements of concentration on the surface of the wall showed that changes in concentration in the surface of the wall near the jet spout were large. Concentration on the surface of the wall within 1.5m from the seam-jet was larger than the value of drag reduction of saturated concentration or 25 ppm. Over a very long distance in the back part, especially of the revolving body, there seemed to be a region in which changes in concentration were small. It was rather difficult to summarize the changes in concentration on the surface of the wall in an expression as represented in reference (3), in particular as regards the region where  $C_w/C_j = 1$ . In the situation described in this article, the concentration on the surface of the wall was undoubtedly affected by the angle of the injection, the pressure field and the curvature of the surface of the body.

Table 1. Concentration of the Jet on the Surface of the Wall of the Flat Plate

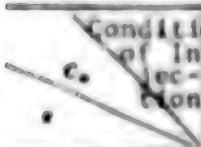
	Condition	$V = 1.340$	$V = 5.106$	$V = 6.561$	$V = 7.820$	$V = 9.490$
	$Q_j = 1.0$	$Q_j = 1.0$	$Q_j = 1.0$	$Q_j = 1.0$	$Q_j = 1.0$	$Q_j = 1.0$
	$C_j = 516$	$C_j = 516$	$C_j = 516$	$C_j = 516$	$C_j = 516$	$C_j = 1000$
0.236		420	476	440	424	862
0.375		310	364	360	340	832
0.681		200	272	204	187	582
1.070		17.2	62.4	60	84	66
2.202		11.3	12.7	14.3	13.1	10.1
2.737		8.3	8.4	8.8	9.6	14.3

Table 2. Concentration of the Jet on the Surface of the Wall of the Revolving Body

Condition of Jet $C_1$ $r$	$V = 4.060$	$V = 5.989$	$V = 6.962$	$V = 4.210$	$V = 4.055$	$V = 4.026^*$
	$Q_1 = 0.735$	$Q_1 = 0.735$	$Q_1 = 0.735$	$Q_1 = 0.735$	$Q_1 = 0.89$	$Q_1 = 0.735$
	$C_1 = 536$	$C_1 = 588$	$C_1 = 588$	$C_1 = 1000$	$C_1 = 588$	$C_1 = 588$
0.454	104	200	233	793	420	462
0.895	116	112	100	530	208	182
1.397	114	104	110	246	136	110
2.199	12.6	5.9	7.7	118	17.8	13.8
2.998	8.1	5.5	6.7	14.7	13.6	11.7
3.798	6.1	5.4	6.2	8.5	11.0	9.4
4.700	6.3	6.0	6.2	8.5	10.0	9.3

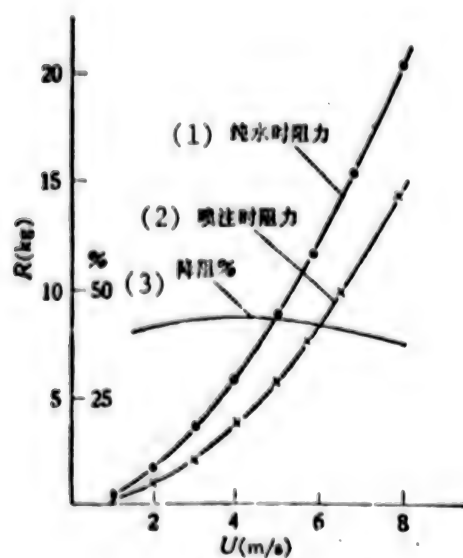


Figure 3. Experimental curve of the drag of pure water and 500 ppm seam-jet of polyethylene oxide over a flat plate

Key:

- 1) drag of pure water
- 2) drag seam-jet
- 3) drag reduction percent

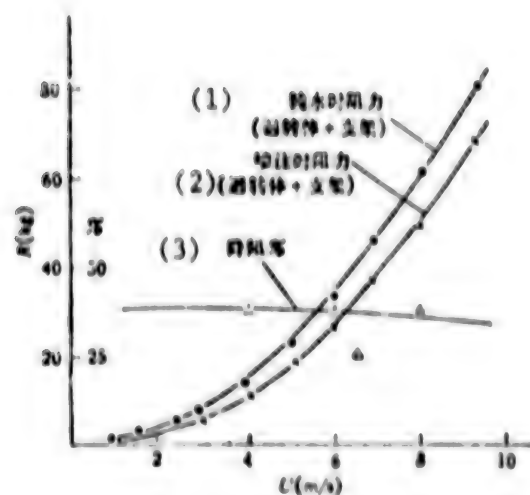


Figure 4. Experimental curve of the drag of a revolving body seam-jetted with polyethylene oxide solution and a comparison between the experimental curve and the theoretically computed percentage of drag reduction

Key:

- 1) drag of pure water (revolving body + support)
- 2) drag of seam-jet (revolving body + support)
- 3) drag reduction percent

#### 4) Comparison Between Theoretical Calculations and Experimental Results

Theoretical calculations were performed for the revolving body at 5.463m at velocities of 4 m/s, 6 m/s and 8 m/s. The method presented in reference (8) was used for stream calculations. Equation (7) was solved by the Runge-Kutta method. When  $C_D = g/0.55U$  and equation (14) for  $(\Delta B)'$  derived from that value were used, the value of drag reduction obtained was slightly lower than that of the actual value. This article used the average value of concentration on the surface of the wall as determined in the experiment for the calculations. The initial value was determined by  $\sigma = A \ln \delta^* + b \delta^* + B + \Delta B$ . The thickness of the boundary layer was  $\delta = 0.0598s / (\log Re_s - 3.17)$ , where  $s$  represents the arc length and the corresponding Reynolds number was  $Re_s$ . In computation,  $\Delta B = c \cdot \log \frac{r_s}{r_{s0}}$  was used. Figure 5 shows the curve of the coefficient of the shearing stress  $\tau_s / \rho U^3 = 1/\sigma^2$  of polyethylene oxide jetted at 500 ppm and of pure water.

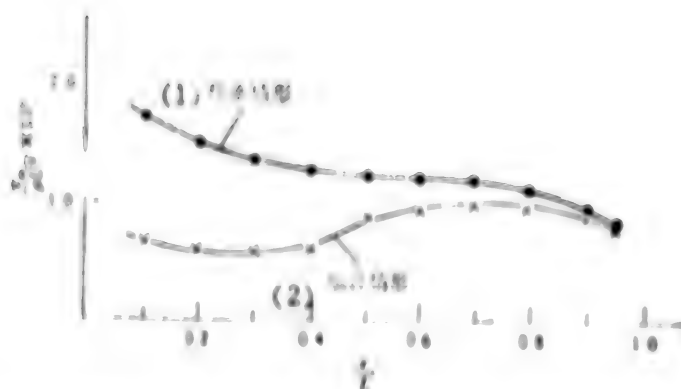


Figure 5. Curve of theoretical calculation of pure water and of the jet

Key:

- 1) pure water condition
- 2) jetting condition

The value of friction drag and the value of drag reduction were obtained separately by integrating the shearing stress of pure water over the surface of the wall and of the jet of solution and their difference. Figure 4 also shows the percentages of drag reduction computed theoretically. The diagram shows that the theoretical computations and the results of the experiments basically coincide. This method can be used in the calculations to forecast drag reduction of a jet in revolving bodies. But strictly speaking, the use of the Meyer's model for external flow, especially external flow of even concentration where the form  $\Delta B = F(C_0) \ln \frac{r_0}{r_{00}}$  is presupposed, requires proof by direct measurements.

The physical meanings of each term in equation (7) discussed in this article are clear, computations are simple, and the equation has given us a way of computing drag reduction that basically coincides with experimental results.

Comrade Zou Dexiang [6760 1795 4382] and Wang Guiqin [3769 2710 5367] provided the data on concentration measurements.

#### BIBLIOGRAPHY

1. Test, F.L., J. HYDRONAUTICS, 8, 2 (1974) 45-46.
2. Sedov, L.I., Vanetskaya, N.G. and Isoselovich, V.A., "Calculation of Turbulent Boundary Layer with Polymer Additives," ICDs, Cambridge, England, Sept 1974, B6-69.
3. Frumen, D.H. and Tulin, M.P., JSR, 20, 3 (1976) 171-180.



4. White, F.M., TRANS. ASME, Series D, 91, 3(1969), 371-378.
5. Meyer, W.A., AIChEJ, 12, 3 (1966), 522-525.
6. Graville, P.S., "The Calculation of Viscous Drag of Bodies of Revolution, DTMB, 8849 (1953).
7. Porch, M. and Hsu, K.S., J. HYDRONAUTICS, 6, 1 (1972).
8. Young, A.D. and Owen, P.R., "A Simplified Theory for Streamline Bodies of Revolution and its Application to the Development of High Speed Shapes," ARC, R and M-2071 (1943).
9. Graville, P.S., ISP, 7, 69 (1960).

9296

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MAGNETOTHERAPY SUCCESSFUL IN TREATING NEARSIGHTED YOUNGSTERS

Beijing BEIJING RIBAO in Chinese 19 Feb 80 p 2

[Text] Editor's note: Quite a few youngsters suffer from nearsightedness, and the number is continuously increasing. This is a problem which is of very great concern. The health, education, scientific research and other concerned departments must make an effort to invent a highly effective and simple method of preventing nearsightedness. The leadership should give full support and encouragement to the "magnetotherapeutic eyeglasses" developed by Guangnei Hospital. The eyeglasses have had an encouraging therapeutic effect regarding prevention. They should not be downplayed or neglected, even though there are a series of problems yet to be solved regarding theory and practice. Through everyone's efforts, in several years the invention will reduce the prevalence of nearsightedness in students by 10 percent. Then, we will have made a very good contribution to our four modernizations.

Dr Zhao Wenqing [6392 2429 3237] and his assistant, Ding Wanxuan [0002 8001 6693], Ophthalmology Unit, Guangnei Hospital in Xuanwu District, invented the "magnetotherapeutic eyeglasses" through hard work in research and practice in treating nearsighted youngsters. The invention has achieved remarkable results.

Throughout the world, magnetotherapy has been studied for quite some time--for instance magnetic necklace, magnetic pillow, magnetic chair and magnetic watch, etc.--for treating various diseases. However, this is the first time that "magnetotherapeutic eyeglasses" have been used to treat nearsightedness. "Magnetotherapeutic eyeglasses" are divided into two kinds: "electromagnetic eyeglasses" and "permanent magnetic eyeglasses." The "electromagnetic eyeglasses" produce a magnetic force after sending electrical current, and are used for mass treatment at outpatient clinics. "Permanent magnetic eyeglasses" do not need an electric current source and are used for individual therapy at home. It is simple,

convenient, painless and without side effects. Patients wear the "magnetotherapeutic eyeglasses" for 20 minutes and test their vision 10 minutes later after resting and removing the glasses every day, every other day, or twice a week. A course of therapy consists of 5 to 10 sessions. The healing effect is positive.

Every week or biweekly, magnetotherapy is given, and if continued for a longer period, the patient will maintain good vision. In Guangnei Hospital, the "magnetotherapeutic eyeglasses" have been used on 723 eyes of 364 patients suffering from nearsightedness in corrective treatment. It was observed that an absolute majority of the patients obtained a certain effect in a short period of time. In general nearsightedness can be corrected and the eye returned to normal vision by one treatment course.

Guangnei Hospital has quite a few advantages and has made treatment convenient for the patients, but the period of practice has been short and a series of problems regarding the theory has yet to be solved. The long term therapeutic effects still must be observed. This hospital will take further steps to proceed with investigation and provide better service to the patients.

In the process of inventing "magnetotherapeutic eyeglasses," the hospital was aided by the technical staff of Plant No 4 of the Beijing Broadcasting and Television Parts Bureau and Chen Sumei, a physics teacher at Beijing High School No 134.

9474

CSO: 4008

AUTHOR: WU Lie [2976 3525]  
WANG Rupeng [3769 3067 7720]

ORG: None

TITLE: "Linfen Earthquake of a Magnitude of 8"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79 pp 1-2, 8

ABSTRACT: This paper relates the historical record of the earthquake occurred in Linfen of Shanxi Province at 8 p.m. on 18 May 1695. The area of destruction extended 500 km and included more than 30 counties of the 4 provinces of Shanxi, Shaanxi, Hebei, and Henan. The paper gives a general description of the damage and the geological background of Linfen, which is a fault basin. The major faults of the basin remain active today. The south and north ends of the basin are both blocked by upheavals while within the basin, there is a close to horizontal tectonic development, displaying obvious shifting movement. For these reasons, Linfen is a region where great stress can be easily accumulated. It should be one of those regions closely monitored in the future.

AUTHOR: MENG Zhengfu [1322 2973 1133]

ORG: None

TITLE: "Report of an Investigation of Chayu Earthquake"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79 pp 3-4

ABSTRACT: On 15 Aug 1950 an earthquake of a magnitude of 8.5 occurred in the vicinity of Chayu of Xizang [Tibet]. It was of such an intensity as to be rare in the earthquake history of China, yet due to the remoteness and inaccessibility of the region, its condition had not been understood. In Jun 76, the Geophysics Team of the Qinghai-Xizang Plateau Scientific Investigation Group of Chinese Academy of Sciences dispatched four of its members to that region to carry out a special survey. Aside from observing some earthquake sites in Motuo County, the surveyors called 3 meetings and interviewed some older commune members who still remembered the days of the earthquake. Just before the earthquake, there were considerable gushes of water from under the ground. The crops of Motuo Village grew better than usual that year and no one noticed any abnormal reactions of cows, pigs, or other animals. The earthquake phenomena and its damage are described. There were 900 dead in Motuo County alone. Three to four earthquakes had been felt since then in that region, but none resulted in any destruction.

AUTHOR: ZHANG Dechang [1728 1795 2052]

ORG: None

TITLE: "Wuyuan 6 Magnitude Earthquake Briefly Related"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
p 4

ABSTRACT: An earthquake of a magnitude of 6.0 occurred in Wuyuan County of Nei Mongol Autonomous Region. The epicenter was at  $41^{\circ}14'N$ .lat.  $108^{\circ}17'E$ .long. There was first an earthquake of 6.0 at 0 hour 59 minutes, then there was another earthquake of 5.2 at 01 hour 03 minutes, but the epicenter of the second shifted to the southeast for about 20 km. Most of the buildings suffered small cracks only and a few old houses collapsed. There was no death. There were no uncommon phenomena other than the fact that the day before the earthquake a fisherman reported catching 20 jin of fish, while ordinarily he had never caught more than 2-3 jin a day

AUTHOR: WU Jiayi [0702 0163 5065]

ORG: None

TITLE: "Hugo Benioff"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Oct 79  
pp 5-8

ABSTRACT: This paper is a short biography of the U.S. astronomer turned seismologist and instrument maker Hugo Benioff, 1899-1968. The strain release curve or creep curve and the linear strain seismograph, both created by Benioff and the so-called Benioff zone are mentioned. His other contributions to the theory of geology and seismology are also explained and discussed.



AUTHOR: SHEN Junxian [3088 6874 6343]

ORG: None

TITLE: "Relationship Between Electrical Potential of Plants and Earthquake"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79 pp 9-11

ABSTRACT: This paper relates experiments carried out by Japanese plant physiologists with the tree species *Albizia julibrissin*, Durazz to study the relationship between electrical potential of plants and earthquake. Two types of wave shapes, the large wave and the sudden peak, were found to be somewhat related to earthquakes. On 5 occasions, earthquakes of a magnitude of 1-3 occurred about 37, 6, 20-50, 48, and 59 hours following the appearance of these anomalies of electrical potential of the tree. It seems that when such abnormal wave shapes of electrical potential of plants occur at night, they may be regarded as signs foretelling imminent occurrence of an earthquake.

AUTHOR: LIU Yin [0491 4481]

ORG: None

TITLE: "A Discussion of the Liquefaction of Sandy Soil"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79 pp 11-13

ABSTRACT: Under the action of intense earthquake, sandy soils below the ground water table may change their characteristics obviously. This phenomenon of liquefaction includes gushing of muddy water, collapse of dams, dikes, or road beds, cracking and settling of ground surface, reduction or loss of load capacity of foundation to cause buildings to sink or collapse. The geological background of these phenomena is discussed. Surveys and research indicate that the maximum depth of ground water table to allow liquefaction to occur is 3 m, and if the soil does not contain more than 10 percent of granules of sizes of 0.02-1.0 mm, liquefaction does not occur easily.

AUTHOR: XIANG Jun [0686 5028]

ORG: None

TITLE: "Earthquakes in the U.S.A."

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
pp 14-17

ABSTRACT: The United States is one of the countries of the world where earthquakes occur frequently. The earliest recorded earthquake occurred in 1534, and from 1900 to 1978, seismic instruments recorded more than 500 earthquakes of a magnitude of 6-6.9, 90 earthquakes of 7-7.9, and 9 earthquakes greater than 8. The geological background of the United States is discussed, dividing the country into 3 earthquake regions of the West, the East, and the Hawaiian Islands. There is a map of the United States depicting the distribution of earthquakes.

AUTHOR: LIN Huixi [2651 1920 2569]

ORG: None

TITLE: "How to Eliminate 50 Cycle Interference of the Type 64 Seismograph"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
p 17

ABSTRACT: The type 64 seismograph of the seismological station where the author works had been constantly troubled by 50 cycle interference. Repeated inspections of the power source, the ground wire, and other electrical instruments of the building failed to correct this. It was finally discovered that the insulation resistance of the case of the seismograph was only  $100K\Omega$ , while the normal value should be greater than  $1M\Omega$ . Careful inspection disclosed that the wax seal of the wire connections had deteriorated. Seismographs are often placed in caves or other damp places to cause wax not to be a suitable insulator. Dampness causes the wax to become a "semiconductor," and to become a channel of power leakage.

AUTHOR: HU Guanghe [5170 7022 0735]

ORG: None

TITLE: "Spontaneous Gushing of Abandoned Oil Wells Before Tangshan Earthquake"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79 pp 18-19

ABSTRACT: An oil well, Wang<sub>11</sub>, which had been abandoned for many years, suddenly gushed with tremendous force for a day in the middle of Jun 76; it gushed one more day 2 weeks later, then, continuously gushed for 3 days on 10 Jul. Another abandoned well, Zheng<sub>1</sub>, gushed a whole day in the middle of July. Since the Tangshan earthquake on 28 Jul 76, gushes of similar intensity occurred again in Wang<sub>11</sub> on 29 Mar 77 and 11 Apr 77, in Zheng<sub>1</sub> on 26 Mar before the 6.2 earthquake occurred in Ninghe on 12 May 77. The 2 Wells are located in Cangzhou District in the periphery of the Tangshan earthquake epicenter at a distance of about 150 km. Following a review of the geological condition of the area, the evidence points to intermittent creep movement of the faults of short durations of several hours. Duration of change of fluid pressure created by the creep movement was obvious longer to cause the water table to change continuously for several days. It is the opinion of the author that the intermittent gushing of the 2 wells may be the result of several intermittent creep movements as well.

AUTHOR: QIAN Fuye [6929 1788 2814]  
ZHAO Yulin [6392 3768 2651]

ORG: None

TITLE: "Interference Factors of Deformation Resistivity (II)"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79 pp 20-21

ABSTRACT: The first part of the paper has introduced interferences caused by defects of the observation system and improper testing technique and those introduced by an artificial change of the environment of the test station. In this the second part, the paper emphasizes seasonal interferences caused by too short a distance of electrodes and too shallow of the probing depth to cause the the surface layer resistivity to be influenced by such factors as the temperature, precipitation, humidity, melting, ground water movement, etc. In some stations, a high resistance shield stratum, such as granite, exists at the site to cause the depth of probing to be shallow. A graph in the paper depicts the range of interference being reduced as the depth of testing increases in China's 40 deformation resistivity stations.

AUTHOR: XIE Guanglin [6200 1684 2651]

ORG: None

TITLE: "Genesis of Ground Fissures of the Northern Foothill of Dabie Mountains"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
pp 22-24

ABSTRACT: In the years just before and just after the Tangshan earthquake, micro anomalies occurred in many areas of East China where strong earthquake did not occur. Were these anomalies caused by human or epigenetic factors? Or, is it possible that macro anomalies can occur under conditions not leading to intense earthquakes? The answer may lie in an analysis of such phenomena as the ground fissures in the northern foothill of Dabie Shan, which cannot be explained by water and soil genesis. From Jul to Nov 74, large fissures were discovered, distributed mainly in a dozen counties of Henan and Anhui, in an area of 100 km by 150 km. During that period, several earthquakes of less than 3 did occur, however. The trend of the fissures indicates that they occurred under a single stress action, unlike those formed by epigenetic forces. Several thousand dwellings were damaged in various degrees, and ground water, animal, and plant anomalies also occurred in the same region. They appear to be a slow creep form of energy release of the earth's crust. A map of the region depicting locations of fissures of various sizes is included.

AUTHOR: LI Yusuo [2621 3768 6956]  
XU Zhi [6079 2535]  
XIE Meijuan [6200 5019 1227]

ORG: None

TITLE: "Why is it Necessary for Ground Magnetism Stations to Carry Out Comparative Tests"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
pp 25-26

ABSTRACT: In the past several years, not a few earthquake regions of the country began to use magnetometer for absolute measurement of ground magnetic field. The nuclear spinning magnetometers made in China have poor stability under prolonged use, however. Some stations did not pay sufficient attention to environmental interference. For example, when intense  $F$  value was discovered at the Niumingbi-zhuang station of Hebei Province, a water pipe was found buried 5 m from the instrument. The test value returned to normal after the pipe was removed. The authors suggest several techniques for comparison test in order to determine whether an anomaly is caused by changes of the earth's magnetic field, or an instability of the instrument, or the result of an environmental change.

AUTHOR: WANG Yuxiu [3769 3768 4423]

ORG: None

TITLE: "Slide for Calculating Earthquake Magnitude"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
pp 27-28

ABSTRACT: Ordinarily, the equation  $M_L = \log A_M + R(\Delta)$  is used to determine the magnitude of the local earthquake. Where,  $A_M$  is ground movement displacement,  $R(\Delta)$  is the function varying with the distance  $\Delta$  from the epicenter. The calculation is time consuming and errors occur easily. This paper introduces a specially designed slide rule for direct reading with an error range of 0.02. The theory and the structure of the slide rule are described. A sample is also given.

AUTHOR: FENG Xiaying [7458 7209 5391]

ORG: None

TITLE: "Effect of Temperature on the Inclinator"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
pp 29-31

ABSTRACT: Since 1973, the station to which the author is affiliated has been carrying out the work of fixed point continuous measurement to observe topographical change. Among the instruments used, there are the metal horizontal pendulum inclinometer, the extensometer, and the water pipe inclinometer. Years of work have produced some data. For the purpose of checking the reliability of these data, an experiment was carried out to study the relationship between the temperature and the deformation of the crust and a correlation between temperature, the instrument, and topographical change. The experiment was conducted in a trench, under conditions of enclosure, open ventilation, artificial increase of temperature, and natural drop of temperature. Results indicate that temperature variations have an obvious interference. Within a 24-hour period, a variation of 1°C of temperature produces a variation of inclination of about 1"-2"0, while to be significant as an earthquake warning sign, the variation of inclination is much smaller. It is therefore necessary to allow the instruments to work under the condition of constant temperature.



AUTHOR: ZHANG Yusong [1728 3768 2646]

ORG: None

TITLE: "Views Concerning Water Radon Content for Earthquake Forecasting"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
pp 32-35

ABSTRACT: The practice of more than a decade has proved that the method of using the variation of radon content of the ground water for earthquake forecasting is worthy of investigation. On the basis of works completed by colleagues of the author the following aspects concerning the technique are discussed: (1) In terms of data selection, the duration should be sufficiently long to depict the entire process of earthquake development. (2) The normal value and normal variation should be precisely determined. (3) Many problems concerning the significance of various types of anomalies remain unresolved. (4) In the future more attention must be given to proper selection of test wells. (5) Studies on the cause of radon anomaly and its relationship with earthquake structure and hydro-geological condition should be carried out. (6) Radon is one of several tens of elements dissolved in ground water. The interrelationship, interaction, and mutual limiting conditions of all these elements should make worthwhile studies.

AUTHOR: ZHU Chengnan [2612 2052 3948]  
ZHOU Ruiqi [0719 3843 3823]

ORG: None

TITLE: "The 6.8 Earthquake in Puer"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
pp 36-37

ABSTRACT: On 15 Mar 79, earthquake of a magnitude of 6.8 occurred in Puer County of Yunnan Province. This paper reports the major results of an on site survey. Damage to two-story dwellings is about 30 percent. The area of damage is 18 km<sup>2</sup>, narrower at the southeastern end than the northwestern end. Judging from the deformation of the pillars, etc. the intensity at the epicenter was ascertained to be 9 and the depth is calculated to be 5 km to indicate it to be a strong earthquake occurring in the shallow part of the earth's crust. The dynamic characteristics of the seismic center are discussed. There have been no record of minor shocks within several months previous. After the earthquake, 8 aftershocks of  $M_s = 4.0-4.9$  were recorded. They have been preliminary determined to be in the north-west direction, in an area of about 320 km<sup>2</sup>.

AUTHOR: WU Songjian [0702 2646 3068]

ORG: None

TITLE: "Are Earthquakes of Fujian and Taiwan Related?"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
pp 38-39

ABSTRACT: A large quantity of historical data and the conditions of seismic activities of recent years indicate a definite relationship between these activities of the 2 provinces. This paper examines the seismic energy relationship of the 2 regions using the method of correlation analysis. A correlation table listing seismic activities between 1975 and 1976 is included.

AUTHOR: ZHU Haizhi [2612 3189 0037]

ORG: None

TITLE: "Liyang Earthquake"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
p 39

ABSTRACT: At 23.1 second, 57 minutes, 18 hour of 9 Jul 79, an earthquake of a magnitude of intensity of 6 occurred in Liyang County of Jiansu Province. According to the Jiansu Provincial Bureau of earthquake, the micro epicenter was 31°27' N. Lat. 119°15' E. long. and the seismic center was at a depth of about 12 km. On 22 Apr 74 an earthquake of 5.5 magnitude occurred nearby, on the east side of Maoshan fault zone; on 10 May 77, another earthquake of 4.1 magnitude occurred on the west side. In view of the distribution of damages, the seismic structure is obviously in the north by northeast direction. All 3 earthquakes appear to be the result of Maoshan fault activity of generally that direction. When peaks of destruction indices are compared, there appears to be a shift toward the southeast, at a difference of about 7 km.

AUTHOR: JIANG QI [5592 0120]

ORG: None

TITLE: "A Method of Arresting Lightning in the Process of Ground Stress Inductance Measurement"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79 pp 40-41, 43

ABSTRACT: In the process of inductance measurement, interference from thunder and lightning often causes the test value to vary suddenly or the insulation of the component to be damaged. The component often cannot perform normally because of thunder and lightning. Nada District of Zhan County, Hainan Island has more than 210 days of thunder storms every year. In 1970, the survey team to which the author was affiliated established a ground stress observation station in Nada. The thunder broke the insulation of the wire to cause the observed data to be useless. It was not until 1972 before the problem was understood and measures were adopted to protect the inductance component from being damaged by the thunder storm. These measures are described.

AUTHOR: LENG Quan [0397 2164]

ORG: None

TITLE: "An Investigation of Insulation Resistivity of Inductance Components"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79 pp 42-43

ABSTRACT: Ground stress inductance measurement is now extensively adopted by many stations. In practice, power leak, due to imperfect manufacturing process of the component, sometimes influences the inductance test value or causes the instrument to perform improperly. The effects of the insulation factor of the component on the test value are analyzed. The paper also suggests several techniques of distinguishing different types of power leak and ways of correcting them.

AUTHOR: OU Maosheng [2962 5399 3932]

ORG: None

TITLE: "Application of Integrated Circuit in the Amplifier of Short Cycle Micro Seismograph"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
pp 44-45

ABSTRACT: From separate components to integrated circuit is a great leap in semiconductor technology. As the manufacturing skill of integrated circuit becomes more mature, the cost is reduced, the volume of the instrument becomes smaller, and its reliability is higher. The plant to which the author is affiliated designed a short cycle micro-seismograph amplifier using integrated circuit. The major property indices, the pre-amplification stage (the input stage), the intermediate amplification stage, and the power amplification stage of the amplifier are explained.

AUTHOR: ZHAO Langda [6392 2494 1129]

ORG: None

TITLE: "Inspecting the Property of the Simple Stress Detector Head"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
pp 46-47

ABSTRACT: In the process of actual use, it is often required that the 4 voltage-reducing resistors in the detection head of the 75-1 simple stress detector have the following properties: (1) Their original resistance should be equal, at 100-500 Ohm. (2) They should have identical stress sensitivity coefficient. (3) They should have the same temperature coefficient. In order to check these properties, the key is to determine the resistivity of all 4 components of the detector head. This paper explains the proper steps for carrying out such an inspection.

AUTHOR: XU Dexiang [1776 1795 4382]  
LI Mengyi [2621 1125 0076-6855]

ORG: None

TITLE: "Strange Burns"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
p 47

ABSTRACT: Intense earthquakes are often accompanied by the appearance of ground light. The phenomenon of being burned by the ground light during an earthquake is, however, not a common event. At 4 o'clock in the morning of 23 Sep 76, an earthquake of an intensity of a magnitude of 6.2 occurred in Bayinsuren Commune of Ningxia Hui Nationality Autonomous Region. In a period from a few minutes to a few seconds before the earthquake, ground light appeared all over the earthquake area, and 4 persons were reported to be burned by the ground light. All four were awakened by a noise and became aware of the imminence of an intense earthquake. As they ran out of the house, they saw the entire area bathed in a fiery light. Several hours later, all 4 persons discovered burns on the sole of their feet. Such phenomena of burns had also been observed during the Haicheng earthquake of Liaoning Province. The relationship between these burns and the earthquake is still not very well understood.

AUTHOR: None

ORG: None

TITLE: "Front Cover"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
p 48, front cover

ABSTRACT: A short item explains the photo of the front cover, depicting the glass pagoda of the Guangsheng Temple of Hongdong County, Shanxi Province. The pagoda was built between 1515 and 1527. The 13 stories measure a height of more than 40 m. The pagoda itself is constructed of brick while the decorations are of glass. Among glass pagodas in China, it is a representative piece. In 1695, an earthquake of a magnitude of intensity of 8 occurred in Linfen basin. The pagoda being on the eastern side of the basin is only 36 km from the epicenter. Its gold tip and 2 small pagodas were destroyed. They were restored during the reign of Kangxi of the Qing Dynasty. After the liberation, renovation of the pagoda was carried out in 1964. It looks almost like new now.



AUTHOR: None

ORG: Institute of Geology, Archive Office, State's Bureau of Seismology

TITLE: "Inside Front and Back Covers"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
inside front and back covers

ABSTRACT: The inside front cover contains photos depicting earthquake damages in Liyang: (1) A street of Nandu Commune destroyed by the 6.0 earthquake on 9 Jul 76; (2) Holes on the ground from which sandy water gushed; (3) Three smokestacks were twisted in a uniform manner; (4) A brick wall collapsed. (5) Dwelling built on a clay stratum suffered very little damage. (6) Building on fine sand stratum almost all collapsed. The inside back cover contains photos depicting earthquake damages in Fuer and Wuyuan: (1) The teacher's dormitory of an elementary school destroyed by the 6.8 earthquake in Fuer, Yunnan Province on 15 Mar 79. (2) Smokestacks of the salt mine collapsed. (3) Ground fissure caused displacement in the field dike. (4) Cracks in the Kunlun-leyang Highway. (5) The seismic center of the 6.0 earthquake of Wuyuan County of Neisenggu Autonomous Region, on 25 Aug 79 was very deep, and the destruction was mild. (6) Individual dwellings did collapse. (7) Localized sand gushing phenomenon occurred in low areas and the abandoned stream beds.

AUTHOR: None

ORG: None

TITLE: "National Youth Scientific and Technological Products Exhibition--  
the Seismology Portion"

SOURCE: Beijing DIZHEN ZHANXIAN [EARTHQUAKE FRONT] in Chinese No 6, 26 Dec 79  
back cover

ABSTRACT: The back cover of the issue contains photos of seismic instruments displayed at the exhibition: (1) Ground magnetometer made by Seismic Survey and Report Group of Overseas Chinese Middle School, Haikou City, Guangdong Province. (2) Inductance magnetometer made by HUANG Jian [7806 0256] of Wuzhou Sixth Middle School, Guangxi. (3) Ground electricity automatic recorder made by WEI Guohua [5898 0948 5478] of Jiguang Middle School, Shanghai. (4) Ground sonic detector made by CHEN Xuanhua [7115 1357 5478] of Zhixin Middle School, Guangzhou, Guangdong. (5) Ground water automatic recorder made by ZHANG Xinlei [1728 1420 5628] of the Activity Station of Yingkou City, Liaoning.

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